ENVIRONMENTAL ASSESSMENT

REDUCING BIRD DAMAGE

IN THE STATE OF CONNECTICUT

Prepared by:

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

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LIST OF APPENDICES

ACRONYMS

APHIS	Animal and Plant Health Inspection Service
AI	Avian Influenza
AOU	American Ornithologists' Union
AQDO	Aquaculture Depredation Order
ARCC	Avian Records Committee of Connecticut
AVMA	American Veterinary Medical Association
BBS	Breeding Bird Survey
BCR	Bird Conservation Region
BO	Biological Opinion
CBC	Christmas Bird Count
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CT DAG	Connecticut Department of Agriculture
CT DEEP	Connecticut Department of Energy and Environmental Protection
EA	Environmental Assessment
ECOFRAM	Ecological Committee on FIFRA Risk Assessment
EEE	Eastern equine encephalitis
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
HP	Highly Pathogenic
IUCN	International Union for Conservation of Nature and Natural Resources
IPN	Infectious Pancreatic Necrosis
MA	Methyl Anthranilate
MBTA	Migratory Bird Treaty Act
MOU	Memorandum of Understanding
MSMSS	Mid-Summer Mute Swan Survey
NAS	National Audubon Society
NASS	National Agricultural Statistics Service
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NWRC	National Wildlife Research Center
ROD	Record of Decision
SOP	Standard Operating Procedure
SVC	Spring Viraemia of Carp
T&E	Threatened and Endangered
USACE	U.S. Army Corps of Engineers
USC	United States Code
USDA	U.S. Department of Agriculture
USDI	U.S. Department of Interior
USGS	United States Geological Survey
USFWS	U.S. Fish and Wildlife Service
VHS	Viral Haemorrhagic Septicaemia
WS	Wildlife Services

CHAPTER 1: PURPOSE AND NEED FOR ACTION

1.1 PURPOSE

The United States Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), Wildlife Services (WS)[1] program in Connecticut is part of a three state program that also includes Massachusetts and Rhode Island. The WS Connecticut, Massachusetts, and Rhode Island program continues to receive requests for assistance to resolve or prevent damage occurring to agricultural resources, natural resources, and property, including threats to human safety, associated with a variety of bird species in Connecticut. There are 427 bird species recorded in Connecticut and accepted by the Avian Records Committee of Connecticut (ARCC). This Environmental Assessment (EA) is intended analyze WS activities to manage damage, threats of damage and threats to human health and safety caused by all species on this list and any species not on this list that may occur in Connecticut in the future. This EA will provide specific analysis of species that have been reported to cause damage, threats of damage, and/or threats to human health and safety or species that have been subject to WS operational management activities, with the exception of Canada geese (*Branta canadensis*), rock pigeons (*Columba livia*), European starling (*Sturnus vulgaris*), and house sparrows (*Passer domesticus*) which have been analyzed in previous EAs. The names and sequences of species being analyzed follow the American Ornithological Union (AOU) Checklist of the Birds of North America (7th ed. 1998 and supplements to the 51st, August 2010).

This list includes snow geese (*Chen caerulescens*), Atlantic brant (*Branta bernicla hrota*), mute swans (*Cygnus olor*), wood ducks (*Aix sponsa*), gadwalls (*Anas strepera*), American wigeons (*Anas americana*), American black ducks (*Anas rubripes*), mallards (domestic/wild) (*Anas platyrhynchos*), blue-winged teals (*Anas discors*), Northern shovelers (*Anas clypeata*), Northern pintails (*Anas acuta*), green-winged teals (*Anas crecca*), canvasbacks (*Aythya valisineria*), redheads (*Aythya americana*), ring-necked ducks (*Aythya collaris*), greater scaups (*Aythya marila*), lesser scaups (*Aythya affinis*), common eiders (*Somateria mollissima*), surf scoters (*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 merganser (*Mergus serrator*), ruddy ducks (*Oxyura jamaicensis*), feral/free ranging geese, feral/free ranging ducks, Northern bobwhites (*Colinus virginianus*), ring-necked pheasants (*Phasianus colchicus*), ruffed grouse (*Bonasa umbellus*), wild turkeys (*Meleagris gallopavo*), common loons (*Gavia immer*), pied-billed grebes (*Podilymbus podiceps*), horned grebes (*Podiceps auritus*), red-necked grebes (*Podiceps grisegena*), double-crested cormorants (*Phalacrocorax auritus*), great blue herons (*Ardea herodias*), great egrets (*Ardea alba*), snowy egrets (*Egretta thula*), little blue herons (*Egretta caerulea*), cattle egrets (*Bubulcus ibis*), green herons (*Butorides virescens*), black-crowned night-herons (*Nycticorax nycticorax*), yellow-crowned night-herons (*Nyctanassa violacea*), glossy ibises (*Plegadis falcinellus*), black vultures (*Coragyps atratus*), turkey vultures (*Cathartes aura*), ospreys (*Pandion haliaetus*), bald eagles (*Haliaeetus leucocephalus*), Northern harriers (*Circus cyaneus*), sharp-shinned hawks (*Accipiter striatus*), Cooper's hawks (*Accipiter cooperii*), Northern goshawks (*Accipiter gentilis*), red-shouldered hawks (*Buteo lineatus*), broad-winged hawks (*Buteo platypterus*), Swainson's hawks (*Buteo swainsoni*), red-tailed hawks (*Buteo jamaicensis*), rough-legged hawks (*Buteo* lagopus), American kestrels (*Falco sparverius*), merlins (*Falco* columbarius), peregrine falcons (*Falco peregrinus*), American coots (*Fulica americana*), black-bellied plovers (*Pluvialis squatarola*), American golden plovers (*Pluvialis dominica*), semi-palmated plovers (*Charadrius semipalmatus*), killdeer (*Charadrius vociferous*), American oystercatchers (*Haematopus*

[1]The WS program is authorized to protect agriculture and other resources from damage caused by wildlife through 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).

palliates), spotted sandpipers (*Actitis macularia*), solitary sandpipers (*Tringa solitaria*), greater yellowlegs (*Tringa melanoleuca*), willets (*Tringa semipalmata*), lesser yellowlegs (*Tringa flavipes*), upland sandpipers (*Bartramia longicauda*), whimbrels (*Numenius phaeopus*), ruddy turnstones (*Arenaria interpres*), red knots (*Calidris canutus*), sanderlings (*Calidris alba*), semi-palmated sandpipers (*Calidris pusilla*), Western sandpipers (*Calidris mauri*), least sandpipers (*Calidris minutilla*), white-rumped sandpipers (*Calidris fuscicollis*), pectoral sandpipers (*Calidris melantos*), purple sandpipers (*Calidris maritima*), dunlins (*Calidris alpina*), buff-breasted sandpipers (*Tryngites suberficllis*), short-billed dowitchers (*Limnodromus griseus*), long-billed dowitchers (*Limnodromus scolopaceus*), American woodcocks (Scolopax minor), Wilson's snipes (*Gallinago delicata*), laughing gulls (*Larus atricilla*), ring-billed gulls (*Larus delawarensis*), herring gulls (*Larus argentatus*), Iceland gulls (*Larus glaucoides*), lesser black-backed gulls (*Larus fuscus*), glaucus gulls (*Larus hyperboreus*), great black-backed gulls (*Larus marinus*), least terns (*Sternula antillarum*), common terns (*Sterna hirundo*), mourning doves (*Zenaida macroura*), monk parakeets (*Myiopsitta monachus*), free ranging parakeets, free ranging parrots, barn owls (*Tyto alba*), Eastern screech owls (*Megascops asio*), great horned owls (*Bubo virginianus*), snowy owls (*Bubo scandiacus*), barred owls (*Strix varia*), long-eared owls (*Asio otus*), short-eared owls (*Asio flammeus*), Northern saw-whet owls (*Aegolius acadicus*), common nighthawks (*Chordeiles minor*), whip-poor-wills (*Caprimulgus vociferus*), chimney swifts (*Chaetura pelagica*), belted kingfishers (*Megaceryle alcyon*), red-headed woodpeckers (*Melanerpes erythrocephalus*), red-bellied woodpeckers (*Melanerpes carolinus*), yellow-bellied sapsuckers (*Sphyrapicus varius*), downy woodpeckers (*Picoides pubescens*), hairy woodpeckers (*Picoides villosus*), Northern flickers (*Colaptes auratus*), pileated woodpeckers (*Dryocopus pileatus*), Eastern phoebes (*Sayornis phoebe*), Eastern kingbirds (*Tyrannus tyrannus*), Northern shrikes (*Lanius excubitor*), blue jays (*Cyanocitta cristata*), American crows (*Corvus brachyrhynchos*), fish crows (*Corvus ossifragus*), common ravens (*Corvus corax*), horned larks (*Eremophila alpestris*), purple martins (*Progne subis*), tree swallows (*Tachycineta bicolor*), Northern rough-winged swallows (*Stelgidopteryx serripennis*), bank swallows (*Riparia riparia*), cliff swallows (*Hirundo pyrrhonota*), barn swallows (*Hirundo rustica*), black-capped chickadees (*Poecile atricapillus*), tufted titmice (*Baeolophus bicolor*), red-breasted nuthatches (*Sitta canadensis*), white-breasted nuthatches (*Sitta carolinensis*), brown creepers (*Certhia americana*), house wrens (*Troglodytes aedon*), Eastern bluebirds (*Sialia sialis*), American robins (*Turdus migratorius*), gray catbirds (*Durnetella carolinensis*), Northern mockingbirds (*Mimus polyglottos*), cedar waxwings (*Bombycilla cedrorum*), dark-eyed juncos (*Junco hyemalis*), snow buntings (*Plectrophenax nivalis*), Northern cardinals (*Cardinalis cardinalis*), red-winged blackbirds (*Agelaius phoeniceus*), Eastern meadowlarks (*Sturnella magna*), common grackles (*Quiscalus quiscula*), brown-headed cowbirds (*Molothrus ater*), purple finches (*Carpodacus purpureus*), house finches (*Carpodacus mexicanus*), American kestrel (*Falco sparverius*), glossy ibis (*Plegadis falcinellus*), and American goldfinch (*Spinus tristis*).

Free-ranging or feral domestic geese and ducks refers to captive-reared, domestic, of some domestic genetic stock, or domesticated breeds of ducks, geese, and swans. Examples of free ranging domestic waterfowl include, but are not limited to, mute swans, Muscovy ducks (*Cairina moschata*), mallard (*Anas platyrhynchos domestica*), derived breeds including Pekin ducks, Rouen ducks, Cayuga ducks, Swedish ducks, and Khaki Campbell ducks; swan goose (*Anser cygnoides*) derived breeds including Chinese geese; and graylag goose (*Anser anser domesticus*); derived breeds including Toulouse geese, Embden geese, and pilgrim geese. Feral ducks may include a combination of domesticated mallards, mallard derived breeds, Muscovy ducks, and mallard-Muscovy hybrids, as well as hybrids of domestic breeds with wild mallards or American black ducks.

Normally, individual wildlife damage management actions conducted by the WS program could be categorically excluded from further analysis under the National Environmental Policy Act (NEPA), in accordance with APHIS implementing regulations for the NEPA (7 CFR 372.5(c); 60 FR 6000-6003). The purpose of this Environmental Assessment (EA) is to evaluate activities conducted by WS to manage damage and threats to agricultural resources, property, natural resources, and threats to humans caused by

birds in the State of Connecticut. This EA will assist in determining if the proposed management of bird damage could have a significant impact on the environment for both humans and other organisms, analyze alternatives to meet the need for action, coordinate efforts with other federal, state, and local agencies, informs the public, and to comply with the NEPA. This EA analyzes the potential effects of bird damage management when requested, as coordinated between WS and the United States Fish and Wildlife Service (USFWS) and the Connecticut Department of Energy and Environmental Protection (CT DEEP).

WS is preparing this EA to: 1) facilitate planning, 2) promote interagency coordination, 3) streamline program management, 4) clearly communicate to the public the analysis of individual and cumulative impacts of proposed program activities; and 5) evaluate and determine if there are any potentially significant or cumulative adverse effects from the proposed program. The analyses contained in this EA are based on information derived from WS' Management Information System, published documents, interagency consultations, public involvement, and the analyses in the USFWS Final Environmental Impact Statement (FEIS) for the management of double-crested cormorants (USFWS 2003).

This EA evaluates 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. Issues relating to cormorant damage management (USFWS 2003) were considered during the development of this EA. The issues and alternatives associated with bird damage management were initially developed by WS in consultation with the USFWS, the CT DEEP, and the Connecticut Department of Agriculture (CT DAG). The USFWS has the overall regulatory authority to manage populations of migratory bird species. The CT DEEP has management authority of wildlife species contained within the State, including bird species. To assist with the identification of additional issues and alternatives to managing damage associated with birds in Connecticut; this EA will be made available to the public for review and comment prior to a Decision[2].

1.2 NEED FOR ACTION

Some species of wildlife have adapted to and thrive 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. The relationship of wildlife values and wildlife damage may 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 are 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*."

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

Both sociological and biological carrying capacities must be applied to 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 directly and indirectly affected by the species and any associated damage. This damage threshold determines the wildlife acceptance capacity. While the habitat may 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, including lethal methods, 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 pose a threat to human safety, people seek assistance with resolving damage or reducing threats to human safety.

The need for action to manage damage and threats associated with birds in Connecticut arises from requests for assistance[3] received by WS to reduce and prevent damage associated with birds from occurring to four major categories: agricultural resources, natural resources, property, and threats to human safety. WS has identified those bird species most likely to be responsible for causing damage to those four categories in the State based on previous requests for assistance and assessments of the threat of bird strike hazards at airports in the State. Table 1.1 lists WS' technical assistance projects involving bird damage or threats of bird damage to those four major resource types in Connecticut from the federal fiscal year[4] (FY) 2006 through FY 2012.

Technical assistance is provided by WS to those requesting assistance with resolving damage or the threat of damage by providing information and recommendations on bird damage management activities 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 Connecticut. Between FY 2006 and FY 2012, WS has conducted 512 technical assistance projects in Connecticut that addressed damage and threats of damage associated with those bird species addressed in this assessment. WS has conducted 102 technical assistance projects involving damage, threats of damage or threats to human health and safety associated with herring gulls, great black-backed gulls, and ring-billed gulls between FY 2006 and FY 2011. These species rank first, fourth and seventh among bird species for the highest number of technical assistance projects conducted. Herring, great black-backed, and ring-billed gulls often congregate in mixed flocks and herring and great

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

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

black-backed gulls often nest in mixed colonies on rooftops. Concerns are often raised about disease transmission to people that encounter gull fecal droppings on their property and vehicles, damage to roofing material through pecking and threats related to rooftop flooding due to accumulations of nesting material on flat rooftops. Downy woodpeckers and hairy woodpeckers rank second and third among bird species for the highest number of technical assistance projects conducted by WS in Connecticut. These species can severely damage residential and commercial buildings in a very short period of time.

Table 1.1 – Technical assistance projects conducted by WS in Connecticut, FY 2006 to FY 2012

Species	Projects	Species	Projects
Red-winged Blackbirds	7	**Hawks, Cooper's**	4
Blackbirds (mixed)	5	**Hawks, Northern Harrier**	5
Buntings, Snow	2	**Hawks, Red-shouldered**	35
Cormorants, Double-crested	5	**Hawks, Red-tailed**	16
Cowbirds, Brown-headed	8	**Hawks, Rough-legged**	2
Crows, American	22	**Hawks, Sharp-shinned**	2
Crows, Fish	1	**Hawks, Other**	1
Doves, Mourning	9	**Herons, Great Blue**	8
Ducks, American Black	12	**Herons, Green**	2
Ducks, Gadwall	2	**Jays, Blue**	1
Ducks, Mallard	19	**Killdeers**	5
Ducks, Common Merganser	1	**Kingfishers, belted**	2
Ducks, Hooded Merganser	3	**Mockingbirds, Northern**	4
Ducks, Blue-winged Teal	1	**Night-herons, Black-crowned**	7
Ducks, Green-winged Teal	1	**Night-herons, Yellow-crowned**	1
Ducks, Wood	1	**Osprey**	11
Eagles, Bald	1	**Owl, Common Barn**	1
Egrets, Cattle	4	**Parakeets, Monk**	11
Egrets, Great	4	**Ravens, Common**	1
Egrets, Snowy	5	**Robins, American**	5
Falcons, American Kestrel	5	**Swallows, Bank**	4
Falcons, Peregrine	1	**Swallows, Barn**	8
Flickers, Northern	2	**Swallows, Tree**	7
Geese, Atlantic Brant	2	**Swans, Mute**	5
Grackles, Common	2	**Turkeys, Wild**	7
Gulls, Great Black-backed	35	**Vultures, Black**	8
Gulls, Herring	62	**Vultures, Turkey**	11
Gulls, Laughing	3	**Woodpeckers, Downy**	49
Gulls, Ring-billed	13	**Woodpeckers, Hairy**	47
Hawks, Broad-winged	7	**TOTAL**	**512**

Table 1.2 lists those bird species and the resource types that those bird species can cause damage to in Connecticut. Many of the bird species can cause damage to or pose threats to a variety of resources. In Connecticut, most requests for assistance received by WS are related to threats associated with those bird species being struck by aircraft at or near airports in the State. 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. WS' activities associated with alleviating bird damage, threats of damage, and threats to human safety at and around airports were also addressed in a separate EA (USDA 2002).

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 Connecticut and the resource types damaged

	Resource*					Resource			
Species	**A**	**N**	**P**	**H**	**Species**	**A**	**N**	**P**	**H**
Blackbirds, Red-winged		X	X	X	Hawks, Sharp-shinned			X	X
Blackbirds, Mixed Species	X		X	X	Herons, Great Blue			X	X
Buntings, Snow			X	X	Herons, Green	X			
Cardinal, Northern			X	X	Ibises, Glossy			X	X
Catbirds, Gray			X	X	Jays, Blue			X	
Cormorants, Double-crested	X	X	X	X	Killdeers			X	X
Cowbirds, Brown-headed			X	X	Kingfishers	X			
Crows, American	X		X	X	Larks, Horned			X	X
Doves, Mourning			X	X	Loons, Common		X		
Dowitchers, Short-billed		X	X	X	Mockingbirds, Northern			X	X
Ducks, American Black	X	X	X	X	Night-herons, Black-crowned	X	X	X	X
Ducks, Bufflehead		X	X	X	Night-herons, Yellow-crowned				
Ducks, Gadwall		X	X	X	Ospreys			X	X
Ducks, Common Goldeneye		X			Owls, Barred			X	X
Ducks, Long-tailed		X	X	X	Owls, Common Barn			X	X
Ducks, Mallard	X	X	X	X	Oystercatchers, American			X	X
Ducks, Common Merganser	X	X	X	X	Parakeets, Monk			X	X
Ducks, Hooded Merganser	X	X	X	X	Pheasants, Ring-necked			X	X
Ducks, Red-breasted Merganser			X	X	Plovers, Black-bellied		X	X	X
Ducks, White-winged Scoter			X	X	Plovers, American Golden			X	X
Ducks, Green-winged Teal			X	X	Plovers, Semi-palmated		X		X
Ducks, American Wigeon		X		X	Ravens, Common			X	X
Ducks, Wood			X	X	Robins, American			X	X
Eagles, Bald			X	X	Sanderlings			X	X
Egrets, Cattle			X	X	Sandpipers, Least		X		X
Egrets, Great		X	X	X	Sandpipers, Semi-palmated		X		X
Egrets, Snowy		X	X	X	Snipes, Wilson's			X	X
Falcons, American Kestrels			X	X	Swallows, Bank			X	X
Falcons, Merlin			X	X	Swallows, Barn			X	X
Falcons, Peregrine			X	X	Swallows, Cliff			X	X
Flickers, Northern			X		Swallows, Tree			X	X
Geese, Atlantic Brant		X		X	Swans, Mute		X	X	X

Species	Resource*				Species	Resource			
	A	N	P	H		A	N	P	H
Geese, Feral			X	X	Terns, Common		X		
Grackles, Common			X	X	Turkeys, Wild			X	X
Gulls, Great Black-backed	X	X	X	X	Vultures, Black			X	X
Gulls, Herring	X	X	X	X	Vultures, Turkey			X	X
Gulls, Laughing		X	X	X	Whimbrels			X	X
Gulls, Ring-billed	X	X	X	X	Woodcocks, American			X	X
Hawks, Broad-winged				X	Woodpeckers, Downy			X	
Hawks, Cooper's	X		X	X	Woodpeckers, Hairy			X	
Hawks, Northern Harrier			X	X	Woodpeckers, Pileated			X	
Hawks, Red-shouldered			X	X	Woodpeckers, Red-bellied			X	
Hawks, Red-tailed	X		X	X	Woodpeckers, Red-headed			X	
Hawks, Rough-legged			X	X	Yellowlegs, Lesser			X	X

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

More specific information regarding bird damage is discussed in the following subsections of the EA:

1.2.1 Need to Resolve Bird Damage to Agricultural Resources

Agriculture continues to be an important sector in the Connecticut economy with the value of agricultural production totaling over $551,553,000 in 2007 (NASS 2009). Agricultural production occurs on 405,616 acres of land in Connecticut on 4,916 farms in 2007 (NASS 2009).

Livestock, dairy, and poultry products accounted for 27.2% of the agricultural cash receipts, worth $150,181,000 in the State during 2007. The top farm commodities for cash receipts were generated from the production of milk and other dairy products from cows which accounted for 13.1% of the cash receipts worth $72,338,000 in the State. Poultry products and eggs together accounted for 8.2% of the cash receipts worth $ 45,274,000 in the State. Aquaculture accounted for 2.7% of the cash receipts worth $15,142,000 in the State.

Crops, including nursery and greenhouse account for 59.7% in cash receipts, worth $401,372,000 in Connecticut during 2007. Nursery, greenhouse, floriculture, and sod account for most of this production and account for 48.8% of the total cash receipts in the State and were worth $269,221.000 in 2007 (NASS 2009). Other important crops include tobacco which accounts for 10.3% of the total cash receipts worth $56,976,000; vegetables, melons, and potatoes which accounts for 5.5% of the total cash receipts worth $30,230,000; and fruits, tree nuts and berries which accounts for 5.2% of the total cash receipts worth $28,641,000 in the State (NASS 2009).

As shown in Table 1.2, many of the bird species addressed in this EA have been identified as causing damage to or posing threats to agricultural resources in Connecticut.

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 species propagated at aquaculture facilities in

Connecticut are mollusks and trout (NASS 2009). In 2007, there were 35 commercial mollusk operations in Connecticut with $11,570,000 in sales (NASS 2009). There were also 9 commercial trout producing operations in the State during 2007 with the value of trout sold at $3,440,000 million (NASS 2009). Of those birds shown in Table 1.2 associated with damage to agriculture, of primary concern to aquaculture facilities in Connecticut are double-crested cormorants, American crows, American black and mallard ducks, common and hooded mergansers, great black-backed, herring and ring-billed gulls, great blue and green herons, black-crowned night-herons, and belted kingfishers.

Double-crested cormorants can feed heavily on fish being raised for human consumption, and on fish commercially raised for bait and restocking in Connecticut (USFWS 2003). The frequency of occurrence of cormorants at a given aquaculture facility can be a function of many interacting factors, including: (1) size of the regional and local cormorant population; (2) the number, size, and distribution of aquaculture facilities; (3) the size distribution, density, health, and species composition of fish populations at facilities; (4) the number, size, and distribution of wetlands in the immediate area; (5) the size distribution, density, health, and species composition of free-ranging fish populations in the surrounding landscape; (6) the number, size, and distribution of suitable roosting habitat; and (7) the variety, intensity and distribution of local damage abatement activities. Cormorants are adept at seeking out the most favorable foraging and roosting sites. As a result, cormorants rarely are distributed evenly over a given region, but rather tend to be highly clumped or localized. Damage abatement activities can shift bird activities from one area to another; thereby, not eliminating predation but only reducing damage at one site while increasing damage at another location (Aderman and Hill 1995, Mott et al. 1998, Reinhold and Sloan 1999, Tobin et al. 2002). Thus, it is not uncommon for some aquaculture producers in a region to suffer little or no economic damage from cormorants, while others experience exceptionally high predation.

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 cormorants 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.

In addition to cormorants, great blue herons are also known to forage at aquaculture facilities (Parkhurst et al. 1987). 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 from 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 Pennsylvania 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 cormorants and herons, other bird species have also 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, osprey, red-tailed hawks, Northern harriers, owls, gulls, terns, American crows, mergansers, common grackles, and brown-headed cowbirds (Parkhurst et al. 1987).

Mallards have been identified by aquaculture facilities as posing a threat of economic loss from foraging behavior (Parkhurst et al. 1987, Parkhurst et al. 1992). During a survey conducted in 1984

of fisheries primarily in the eastern United States, managers at 49 of 175 facilities reported mallards as feeding on fish at those facilities, which represented an increase in the number of facilities reporting mallards as feeding on fish when compared to prior surveys (Parkhurst et al. 1987). Parkhurst et al. (1992) found mallards foraging on trout fingerling at facilities in Pennsylvania. Mallards selected trout ranging in size from 8.9 centimeters to 12.2 centimeters in length. Once trout fingerlings reached a mean length of approximately 14 centimeters in raceways, mallards present at facilities switched to other food sources (Parkhurst et al. 1992). Of those predatory birds observed by Parkhurst et al. (1992), mallards consumed the most fish at the facilities with a mean of 148,599 fish captured and had the highest mean economic loss per year per site based on mallards being present at those facilities for a longer period of time per year compared to other species.

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).

Predation at aquaculture facilities can also occur from American crows (Parkhurst et al. 1987, Parkhurst et al. 1992). During a survey of ten fisheries in 1985 and 1986, American crows were observed at eight of the facilities in central Pennsylvania (Parkhurst et al. 1992). The mean size of trout captured by crows in one study was 22.5 centimeters with a range of 15.2 to 31.7 centimeters (Parkhurst et al. 1992). Crows consumed a mean of 11,651 trout per year per site from ten trout hatcheries in Pennsylvania in 1985 and 1986 (Parkhurst et al. 1992). Since crows selected for larger fish classes at fish facilities, Parkhurst et al. (1992) determined economic losses from foraging by crows led to a higher mean economic impacts at facilities compared to other avian foragers based on the value of larger fish classes.

Although primarily insectivorous during the breeding season and granivorous during migration periods (Peer and Bollinger 1997), common grackles have been identified as feeding on fish (Hamilton 1951, Beeton and Wells 1957, Darden 1974, Zottoli 1976, Whoriskey and Fitzgerald 1985, Parkhurst et al. 1992). During a study of aquaculture facilities in central Pennsylvania, Parkhurst et al. (1992) found grackles feeding on trout fry at nine of the ten facilities observed. The mean length of trout captured by grackles was 7.6 centimeters with a range of 6.0 to 7.9 centimeters. Once fish reached a mean size of 14 centimeters, grackles switched to alternative food sources at those facilities (Parkhurst et al. 1992). Among all predatory bird species observed during the study conducted by Parkhurst et al. (1992), grackles captured and removed the most fish per day per site which was estimated at 145,035 fish captured per year per site.

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 and 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. Birds have been identified as a possible source of transmission of three fish viruses in Europe: Spring Viraemia of Carp (SVC), Viral Haemorrhagic Septicaemia (VHS), and Infectious Pancreatic Necrosis (IPN) (European Inland Fisheries Advisory Commission 1989). VHS and IPN are known to occur in North America (Price and Nickum 1995). SVC has also been documented to occur in North America

(USDA 2003). Peters and Neukirch (1986) found the IPN virus in the fecal droppings of herons when the herons were fed IPN infected trout. Olesen and Vestergaard Jorgensen (1982) found herons could transmit the VHS (Egtved virus) from beak to fish when the beaks of herons were contaminated with the virus. However, Eskildsen and Vestergaard Jorgensen (1973) found the Egtved virus did not pass through the digestive tracks into the fecal droppings of black-headed gulls (*Larus ridibundus*) when artificially inserted into the esophagus of the gulls.

Birds are also capable of passing bacterial pathogens through fecal droppings and on their feet (Price and Nickum 1995). The bacterial pathogen for the fish disease Enteric Septicemia of Catfish (ESC) has been found within the intestines and rectal areas of great blue herons and double-crested cormorants from aquaculture facilities in Mississippi (Taylor 1992). However, since ESC is considered endemic in the region, Taylor (1992) did not consider birds as a primary vector of the disease. Birds also pose as primary hosts to several cestodes, nematods, trematodes, and other parasites which can infect fish. Birds can also act as intermediate hosts of parasites that can infect fish after completing a portion of their life-cycle in crustaceans or mollusks (Price and Nickum 1995).

Although documentation that birds, primarily herons and cormorants, can pose as vectors of diseases known to infect fish, the rate of transmission is currently unknown and is likely very low. Since fish-eating birds are known to target fish that are diseased and less likely to escape predation at aquaculture facilities (Price and Nickum 1995, Glahn et al. 2002) and given the mobility of birds to move from one impoundment or facility to another, the threat of disease transmission is a concern given the potential economic loss resulting from extensive mortality of fish or other cultivated aquatic wildlife if a disease outbreak occurs.

Damage and Threats to Livestock Operations

Damage to livestock operations can occur from several bird species. Economic damage can occur from birds feeding on 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, most economic damage occurs 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 feedlots and dairies in Connecticut are red-winged blackbirds, common grackles, brown-headed cowbirds, and to a lesser extent crows and barn swallows. The flocking behavior of those species either from 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 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 1983, Glahn and Otis 1986). 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 are 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 impact 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).

The economic significance of feed losses to 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. Williams (1983) estimated seasonal feed losses to five species of blackbirds (primarily brown-headed cowbirds) at one feedlot in south Texas at nearly 140 tons valued at $18,000.

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 leave fecal deposits which can be consumed by feeding 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 carrying infectious diseases which can be excreted in fecal matter which not only poses 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.

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. The rate of transmission is likely very low; however, the threat of transmission exists since birds are known vectors of many diseases transmittable to livestock.

Certain bird species are also known to prey upon livestock which can result in economic losses to livestock producers. Vultures are known to prey upon newly born calves and harass adult cattle, especially during the birthing process. The National Agricultural Statistic Services (NASS) reported livestock owners lost 8,600 head of cattle and calves from vultures in the United States during 2006 valued at $3.8 million (NASS 2006). While both turkey vultures and black vultures have been documented harassing expectant cattle, damages are primarily attributed to black vultures. Vulture predation on livestock is distinctive. Black vultures 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. Reports of calf depredation by vultures may occur but have not been reported to WS in Connecticut. However, it is probable that predation events on livestock associated with vultures occur in Connecticut.

Economic losses can also result from raptors, particularly red-tailed hawks and Cooper's hawks, feeding on domestic fowl, such as chickens and waterfowl. Free-ranging fowl or fowl allowed to range outside of confinement for a period of time 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 consumption

(loss of the crop and revenue), but also consists of trampling of emerging crops and compaction of soil by waterfowl, consumption of cover crops used prevent erosion and condition soil, damage to fruits associated with feeding, and fecal contamination. In 2007, cash receipts from agricultural crops accounted for nearly 60% of the cash receipts from all agricultural commodities (crop and livestock) in Connecticut. Of the agricultural crops produced in the State, Nursery, greenhouse, floriculture and sod ranked first in cash receipts received during 2007 followed by tobacco and vegetables, melons and potatoes (USDA 2009).

Other crop commodities harvested in 2007 include corn, wheat, apples and other tree fruit, berries, hay and maple syrup. Cash receipts received from the production of fruits, nuts, and berries in the State during 2007 was estimated at $27,580,000 (USDA 2009). Damage to agricultural crops in Connecticut occurs primarily from American crows, red-winged blackbirds, grackles, cowbirds, and to a lesser extent mallards, woodpeckers, ravens, American robins and other songbirds.

Fruit and nut crops can be damaged by crows, robins, red-winged blackbirds, grackles, cowbirds, and American crows. Besser (1985) estimated bird damage to grapes, cherries, and blueberries exceeded $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).

Bird damage to sweet corn can also result in economic losses to producers. Damage to sweet corn is often amplified since damage to sweet corn caused by birds makes the ear of corn unmarketable because the damage is unsightly to the consumer (Besser 1985). Large flocks of red-winged blackbirds are responsible for most of the damage reported to sweet corn with damage also occurring from grackles (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. Birds will puncture the kernel to ingest the contents. Once punctured, the area of the ear damaged 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 also known to cause damage to sprouting corn (Mott and Stone 1973). Damage to sprouting corn is likely localized and highest in areas where grackle breeding colonies exist in close proximately 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 grackle breeding colony.

1.2.2 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, 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 raptors and waterfowl, can pose risks to human safety.

Threat of Disease Transmission

Birds can play an important role in the transmission of diseases where humans may come into contact with fecal droppings of those birds. Few studies are available on the occurrence of zoonotic diseases in wild birds and on the risks to humans from transmission of those diseases. 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. However, human exposure to fecal droppings through direct contact or through the disturbance of fecal droppings where disease organisms are known to occur increases the likelihood of disease transmission. The gregarious behavior of bird species leads to accumulations of fecal droppings that can be considered a threat to human health and safety due to the close association of those species of birds with human activity. Accumulations of bird droppings in public areas are aesthetically displeasing and are often in areas where humans may come in direct contact with fecal droppings.

Birds can play an important role in the transmission of zoonotic diseases to humans such as Eastern equine encephalitis (EEE), St. Louis encephalitis, West Nile virus, psittacosis, and histoplasmosis. 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.

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, it is the risk of disease transmission that is the primary reason for those persons to request assistance from WS.

Waterfowl may impact 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). Also, 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, Blandespoor 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.

Situations in Connecticut where the threat of disease associated with birds might occur could be: exposure of residents to a bird roost which has been in a residential area for more than three years; disturbance of a large deposit of droppings in an attic where a flock of birds routinely roosts or nests; accumulated droppings from roosting birds on structures at an industrial site where employees must work in areas of fecal accumulation; birds nesting or loafing around a food court area of a recreational facility or other site where humans eat in close proximity to concentrated numbers of birds; or birds depositing waste from landfills in urban, suburban, and other nearby areas.

Threat of Aircraft Striking Wildlife at Airports and Military Bases

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. In 1995, an Air Force E-3B AWACS aircraft collided with a flock of Canada geese at Elmendorf Air Force Base in Alaska which killed all 24 passengers and crew onboard the aircraft. In addition, a $190 million plane was lost (Dolbeer 1997). From 1990 through 2011, a total of 1,186 bird strikes have been reported by aircraft in Connecticut (FAA 2012) resulting in $690,933.00 worth of aircraft damage, $236,263.00 worth of other costs and 5,087 hours of aircraft down time and injuries to 3 people (FAA 2012).

Target bird species when in large flocks or flight lines entering or exiting a roost at or near airports or when present in large flocks foraging on or near an airport, present 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 to be 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).

From 1990 to 2011, 132,229 wildlife strikes have been reported to the FAA in the United States and Canada (FAA 2012). Birds were involved with over 97% of those reported strikes to civil aircraft in the United States (Dolbeer et al. 2009). This number is likely to be much greater since an estimated 80% of civil bird strikes go unreported (Cleary et al. 2005, Wright and Dolbeer 2005). In Connecticut, nearly 98% of the reported aircraft strikes have involved birds (Dolbeer et al. 2009, FAA 2012). Aircraft in Connecticut have struck at least 61 species of birds based on strike reports (FAA 2012). Of these, 46 species have been positively identified by the Smithsonian Institution's Feather Identification Laboratory (FAA 2012). Generally, bird collisions occur when aircraft are near the ground during take-off and approach to the runway. From 1990 to 2008, approximately 60% of reported bird strikes to civil aviation aircraft in the United States occurred when the aircraft was at an altitude of 100 feet above ground level or less. Additionally, 72% occurred less than 500 feet above ground level and approximately 92% occurred under 3,000 feet above ground level (Dolbeer et al. 2009).

Birds being struck by aircraft can cause substantial damage to aircraft. 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 and Wright 2008). A recent example occurred on 15January 2009 in New York City when Flight 1549 struck a flock of Canada geese causing the plane to crash land on the Hudson River. Known as the "Miracle on the Hudson" all 155 people aboard survived due to the actions of the pilot and co-pilot.

Additional Human Safety Concerns Associated with Birds

Other impacts of birds on human health and safety result from the aggressive behavior exhibited by raptors, Northern mockingbirds, and waterfowl during the nesting season. Raptors, mockingbirds,

and waterfowl aggressively defend their nests, nesting areas, and young, and may attack or threaten pets, children, and adults (Smith et al. 1999, T. Cozine Per. Obs. 2011). Raptors and mockingbirds often nest in trees, building rooftops or ledges, or other structures in urban and suburban areas. Mute swans and feral waterfowl often nest 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 raptors, mockingbirds, or waterfowl or their nests at those locations, injuries could occur if the birds react aggressively to the presence of those people or pets either directly due to contact or incidentally due to falls while trying to avoid attack. Slipping hazards can be created by the buildup of feces from birds on docks, walkways, and other foot traffic areas. If fecal dropping occur in areas with foot traffic, slipping could occur resulting in injuries to people. To avoid those conditions, regular clean-up is often required to alleviate threats of slipping on fecal matter which can be economically burdensome. Additionally, waterfowl, such as ducks, turkeys and other birds can present a traffic hazard. Trying to avoid striking birds in roadways can result in automobile accidents if drivers leave the roadway or stop short in traffic resulting in a rear end collision. Traffic accidents can result in human injury or even death.

Human safety concerns due to monk parakeet nesting on electrical utility poles and transmission structures also exist. These include the possible loss of power to critical care facilities, risk of injury to maintenance crews, and increased incentives to and risks of trespassing. In some service areas, e.g. New York City, distribution poles with lines connecting to residences have signs indicating that the resident is on some type of life support system requiring continuous power. Nests on these poles or nearby distribution feeders pose a significant risk to these residents. Crews taking down nests are also at increased risk of injury and need to be protected from nest materials that contain mites and other insects that can cause itching and discomfort. Because of the trade in monk parakeets in the pet industry, it is common for people to personally trap monk parakeets and to sell them to pet shops and other individuals. Wild caught monk parakeets can be sold to pet owners and a number of electrocutions have occurred to individuals who have trespassed and climbed into substations to trap monk parakeets (Newman et al. 2004).

1.2.3 Need to Resolve Bird Damage Occurring to Property

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

Gulls, doves, raptors, and waterfowl are 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 2008, over 19% involved gulls where identification of the species occurred, pigeons and doves comprised nearly 15% of the total reported strikes while raptors accounted for 13% and waterfowl were identified in 8% of reported strikes. When struck, 28% 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 28% of strikes involving raptors and 13% of

strikes involving pigeons and doves (Dolbeer et al. 2009). Since 1990, over $101 million in damages to civil aircraft have been reported from strikes involving waterfowl (Dolbeer et al. 2009). In total, aircraft striking birds has resulted in over $308 million in reported damages to civil aircraft since 1990 in the United States (Dolbeer et al. 2009).

Damage to property associated with large concentrations of roosting birds occurs primarily from accumulations of droppings and feather debris. Many of the bird species addressed in this assessment are gregarious (*i.e.*, form large flocks) especially during the fall and spring migration periods. Although damage and threats can occur throughout the year, damage 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. 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 reoccurring presence of fecal droppings under bird roosts can lead to constant cleaning costs for property owners.

Gull attraction to landfills as a food source has been well documented (Mudge and Ferns 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 and use 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.

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 the uric acid found in bird droppings. Electrical utility companies frequently have problems with birds and bird droppings causing power outages by shorting out transformers and substations. This has resulted in outage time for power companies and consumers. Damage can also occur from droppings entering into food items or contaminating surfaces used to prepare food items at manufacturing facilities and can introduce undesirable components into the materials used in manufacturing processes.

The nesting behavior of some bird species can also cause damage to property. Nesting material can be aesthetically displeasing and fecal droppings often accumulate near nests which can also be aesthetically displeasing. Many bird species are colonial nesters meaning they nest together in large numbers. Many of the gull, cormorant, egret, and heron species as well as monk parakeets addressed in this assessment nest in large colonies. Swallows can also nest in large colonies. Roof-top colonies of nesting gulls have been well documented and frequently cause damage to urban and industrial structures. Nesting gulls peck at spray-on-foam roofing and rubber roofing material, including caulking. This creates holes that must be repaired or leaks in the roof can result. Gulls transport large amounts of nest material and food remains to the roof-tops which can obstruct roof drainage systems and lead to structural damage or roof failure if clogged drains result in rooftop flooding (Vermeer et al. 1988, Blokpoel and Scharf 1991, Belant 1993). Nesting material and feathers can also clog ventilation systems resulting in cleaning and repairs. During the annual molt, herring gull feathers can accumulate in piles over a meter in depth on rooftops (T. Cozine Per. Obs.).

Monk parakeets build large colonial nests from sticks in trees and on utility poles.

Monk parakeet nests can cause decrease in electric reliability, equipment damage, lost revenue from nest and bird caused power outages, increase in operation and maintenance costs associated with nest removal and repair of damaged structures, and public safety concerns. Monk nests attract predators (including humans) that also can cause outages. Problems with nesting on utility structures have been reported in Connecticut, Rhode Island, New York, New Jersey, Colorado, Florida, and Texas (Newman et al. 2004, Nehls 2002, and Buhler et al 2001). If their nests are built on light or electrical utility poles, the bulbs or transformers can overheat, causing fires and blackouts. The weight of a nest can cause its support, trees or man-made structures, to collapse (Stafford 2003). For example, for a five-month period in 2001 a total of 198 outages related to monk parakeets were logged and affected over 10,000 customers in two counties in South Florida. The frequency of outages increases during wet weather. These outages result from nesting material completing an electric circuit between two energized parts or an energized part and a grounded part of electrical equipment. In some cases the nests get too large and complete an electric circuit. In other cases individual monks can bring nesting materials that can result in completing a circuit. Fires can start in the nesting material causing damage to transformers and other utility equipment (Newman et al. 2004). Monk Parakeet nests, in their native range, can grow up to over 200 chambers, with some weighing up to 1,180 kg (2,600 lbs.) (Burgio 2012). In Connecticut nests range from one to twenty chambers in size, weighing up to 41 kg (90 lbs.). These nests can result in damage to ornamental trees when they become too heavy to support or because of increased susceptibility to wind damage resulting in broken branches. Falling nests can damage buildings, automobiles and other property.

1.2.4 Need to Resolve Bird Damage Occurring to Natural Resources

Birds can also negatively impact 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 impacts characteristics of the surrounding habitat that can adversely affect other wildlife species and can be 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 Connecticut occurs primarily in areas where colonial waterbirds nest 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, such as cormorants and herons, can lead to the loss of vegetation due to the ammonium nitrogen found in the fecal droppings of birds. Ammonium toxicity from fecal droppings may be an important factor contributing to the declining presence of vegetation on some islands in the Great Lakes (Hebert et al. 2005). 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 10 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). For example, the establishment of cormorant colonies on islands in the Great Lakes could threaten the unique vegetative characteristic of many of those islands (Hebert et al. 2005). In some cases, the establishment of colonial waterbird nesting colonies on islands has led to the complete denuding of the island of vegetation. The removal

of vegetation can lead to an increase in erosion of the island and can be aesthetically displeasing to recreational users.

Lewis (1929) considered the killing of trees by nesting cormorants to be very local and limited, with most trees having no commercial timber value. However, tree damage may be perceived as a problem if those trees are rare species, or aesthetically valued (Bédard et al. 1999, Hatch and Weseloh 1999). In addition to habitat degradation, nesting colonial waterbirds can adversely affect other wildlife species. Cormorants are known to displace other colonial nesting bird species such as black-crowned night herons, egrets, great blue herons, gulls, common terns, and Caspian terns through habitat degradation and nest site competition (USFWS 2003). Cuthbert et al. (2002) examined potential impacts of cormorants on great blue herons and black-crowned night herons in the Great Lakes and found that cormorants have not negatively influenced breeding distribution or productivity of either species at a regional scale, but did contribute to declines in heron presence and increases in site abandonment in certain site specific circumstances.

Cormorants can have a negative impact on vegetation that provides nesting habitat for other birds (Jarvie et al. 1999, Shieldcastle and Martin 1999) and wildlife, including State and federally-listed T&E species (Korfanty et al. 1999). Cuthbert et al. (2002) found that cormorants have a negative effect on normal plant growth and survival on a localized level in the Great Lakes region. Wires and Cuthbert (2001) identified vegetation die off as an important threat to 66% of the colonial waterbird sites designated as conservation sites of priority in the Great Lakes of the United States. Of the 29 priority conservation sites reporting vegetation die off as a threat, Wires and Cuthbert (2001) reported cormorants were present at 23 of those sites. Based on survey information provided by Wires et al. (2001), biologists in the Great Lakes region reported cormorants as having an impact to herbaceous layers and trees where nesting occurred. Damage to trees was mainly caused by fecal deposits, and resulted in tree die off at breeding colonies and roost sites. Impacts to the herbaceous layer of vegetation were also reported due to fecal deposition, and often this layer was reduced or eliminated from the colony site. In addition, survey respondents reported that the impacts to avian species from cormorants occurred primarily from habitat degradation and from competition for nest sites (Wires et al. 2001). Although loss of vegetation can have an adverse impact on many species, some colonial waterbirds such as pelicans and terns prefer sparsely vegetated substrates.

Monk parakeet nesting can damage wild trees in the same manner it may damage ornamental trees. When the nest become too heavy to support or because of increased susceptibility to wind damage, broken branches or even toppling of trees may result.

Large accumulations of fecal droppings under crow roosts could have a detrimental impact on desirable vegetation. A study conducted in Oklahoma found fewer annual and perennial plants in locations where crows roosted over several years (Hicks 1979).

Large concentrations of waterfowl have affected water quality around beaches and in wetlands by acting as nonpoint source pollution. There are four forms of nonpoint source pollution: sedimentation, nutrients, toxic substances, and pathogens. Large concentrations of waterfowl can remove shoreline vegetation resulting in erosion of the shoreline and soil sediments being carried by rainwater into lakes, ponds, and reservoirs (USFWS 2005).

Scherer et al. (1995) stated that waterfowl metabolize food very rapidly and most of the phosphorus contributed by bird feces into water bodies probably originates from sources within a lake being studied. In addition, assimilation and defecation converted the phosphorus into a more soluble form and, therefore was considered a form of internal loading. Waterfowl can contributed substantial amounts of phosphorus and nitrogen into lakes through feces creating excessive aquatic macrophyte

growth and algae blooms (Scherer et al. 1995) and accelerated eutrophication through nutrient loading (Harris et al. 1981).

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

Crows are considered omnivorous, consuming a variety of invertebrates, amphibians, reptiles, mammals, and small birds, including birds' eggs, nestlings, and fledglings as well as grain crops, seeds, fruits, carrion, and discarded human food (Verbeek and Caffrey 2002). With crows, the primary concern to natural resources occurs from predation on T&E species. Crows have been documented feeding on piping plover eggs and nestlings. They have even been documented waiting on top of covered predator exclosures over piping plover nests, preying on chicks as they attempt to leave (M. Hake Pers. Comm.). Piping plovers are currently considered a threatened species by the USFWS and by the CT DEEP.

Other avian predators are known to prey on nesting piping plovers and terns. These include black-crowned night herons, common grackles, red-winged blackbirds, ruddy turnstones, great horned owls, peregrine falcons, Northern harriers and American kestrels are also known to feed on nesting colonial water birds and shorebirds, their chicks and/or eggs (USACE 2009, Ivan and Murphy 2005, Rimmer and Deblinger 1990, Farraway et al. 1986, Hunter and Morris 1976). The WS program in Connecticut has participated in interagency agreements to address black-crowned night heron and gull predation on common terns and federally and state endangered roseate terns inhabiting coastal islands of Connecticut.

Brood parasitism by brown-headed cowbirds has also become a concern for many wildlife professionals where those birds are plentiful. Inter-specific competition has been well documented in brown-headed cowbirds, which are known to parasitize the nests of at least 220 avian species (Lowther 1993).

1.3 SCOPE OF THIS ENVIRONMENTAL ASSESSMENT

1.3.1 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 Connecticut wherever such management is requested by a cooperator. This EA discusses the issues associated with conducting bird damage management in the State to meet the need for action and evaluates different alternatives to meeting that need while addressing those issues.

1.3.2 Native American Lands and Tribes

Currently, WS does not have a Memorandum of Understanding (MOU) or signed cooperative service agreements with any Native American tribe in Connecticut. If WS enters into an agreement with a tribe for bird damage management, this EA would be reviewed and supplemented, if appropriate, to insure compliance with the NEPA.

1.3.3 Period for which this EA is Valid

If the analyses in this EA indicates an Environmental Impact Statement (EIS) is not warranted, this EA will remain valid until WS, in consultation with the USFWS and the CT DEEP, determines that new needs for action, changed conditions, new issues, or new alternatives having different environmental impacts must be analyzed. At that time, this analysis and document will be reviewed and supplemented pursuant to the NEPA. Review of the EA will be conducted each year to ensure that the EA is sufficient and appropriate for actions conducted under the selected alternative. This process ensures the EA is complete and still appropriate to the scope of bird damage management activities conducted by WS in Connecticut annually.

1.3.4 Site Specificity

This EA analyzes the potential impacts of bird damage management and addresses activities on all private and public lands in Connecticut under a MOU, cooperative service agreement, and in cooperation with the appropriate public land management agencies. The EA also addresses the impacts of bird damage management on areas where additional agreements may be signed in the future. Because the proposed 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 bird damage management efforts could occur. Thus, this EA anticipates the potential expansion and analyzes the impacts of such efforts as part of the proposed program.

Planning for the management of bird damage must be viewed as being conceptually similar to federal or other agency actions whose missions are to stop or prevent adverse consequences from anticipated future events for which the actual sites and locations where they will 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. Although some of the sites where bird damage will occur can be predicted, all specific locations or times where such damage will occur in any given year cannot be predicted. This EA emphasizes major issues as they relate to specific areas whenever possible; however, many issues apply wherever bird damage and the resulting damage management activities occur, and are treated as such. The standard WS Decision Model (Slate et al. 1992) would be the site-specific procedure for individual actions conducted by WS in Connecticut. The WS Decision Model is discussed further in Chapter 3.

The analyses in this EA are intended to apply to any action that may occur in any locale and at any time within Connecticut. 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 its mission.

1.3.5 Summary of Public Involvement

Issues and alternatives related to bird damage management as conducted by WS in Connecticut were initially developed by WS in consultation with the USFWS and the CT DEEP. 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 in the State, and by posting the EA on the APHIS website at http://www.aphis.usda.gov/wildlife_damage/nepa.shtml.

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

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 CT DEEP is responsible for managing wildlife in the State of Connecticut, including birds. The CT DEEP establishes and enforces regulated hunting seasons in the State, including the establishment of seasons that allow the take of some of the bird species addressed in this assessment. For migratory birds, the CT DEEP can establish hunting seasons for those species under frameworks determined by the USFWS. WS' activities to reduce and/or prevent bird damage in the State will be coordinated with the USFWS and the CT DEEP which ensure WS' actions are incorporated into population objectives established by those agencies for bird populations in the State. 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 the CT DEEP; therefore, the take of those bird species by WS to alleviate damage or reduce threats of damage will only occur at the discretion of those agencies. In addition, WS' annual take of birds to alleviate damage or threats of damage will 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: 1) should WS conduct bird damage management to alleviate damage to agriculture, property, natural resources, and threats to human safety, 2) should WS conduct disease surveillance and monitoring in the bird population when requested by the CT DEEP, the USFWS, and other agencies, 3) should WS implement an integrated wildlife damage management strategy, including technical assistance and direct operational assistance, to meet the need for bird damage management in Connecticut, 4) if not, should WS attempt to implement one of the alternatives to an integrated damage management strategy as described in the EA, and 5) would the proposed action result in adverse impacts to the environment requiring the preparation of an EIS.

1.5 RELATIONSHIP OF THIS DOCUMENT TO OTHER ENVIRONMENTAL DOCUMENTS

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

Wildlife Damage Management at Airports in Connecticut Environmental Assessment: WS has developed an EA that analyzes a need for action to manage damage associated with wildlife damage and threats at and around airports in Connecticut (USDA 2002). The EA identified issues associated with wildlife strikes with aircraft and associated damage, human injury or death, threats of strike damage, human injury and death, damage and threats of damage to airport facilities and equipment, and human

health and safety threats to ground personnel and passengers related to wildlife and analyzed alternatives to address those issues. After review of the analyses in the EA, a Decision and Finding of No Significant Impact (FONSI) were signed on April 29, 2002, selecting the proposed action to implement an integrated approach to managing damage and treats at and around airports in the State. The EA and the 2002 Decision/FONSI are being re-evaluated based on activities conducted by WS since the signing of the Decision in 2002 and a Supplement to the EA Wildlife Damage Management at Airports in Connecticut is currently being prepared.

***Canada Goose Damage Management Environmental Assessment*:** WS has developed an EA that analyzes a need for action to manage damage associated with Canada geese in Connecticut (USDA 2004). The EA identified issues associated with goose damage management and analyzed alternatives to address those issues. After review of the analyses in the EA, a Decision and Finding of No Significant Impact (FONSI) were signed on July 15, 2004, selecting the proposed action to implement an integrated approach to managing goose damage in the State. The EA and the 2004 Decision/FONSI were re-evaluated based on activities conducted by WS since the signing of the Decision in 2004. A Supplement to the EA Canada Goose Damage Management in Connecticut was prepared in 2012 and, a new Decision and FONSI were signed on December 6, 2012.

***Reducing Pigeon, Starling, and Sparrow Damage through an Integrated Wildlife Damage Management Program Environmental Assessment*:** WS has also developed an EA that analyzes the need for action to manage damage associated with rock pigeons, European starlings, and house sparrows. The EA identified the issues associated with managing damage associated with pigeons, starlings, and house sparrow in the State and analyzed alternative approaches to meet that need while addressing the identified issues (USDA 2007). Based on the analyses in the EA, a Decision and FONSI were signed on January 24, 2007 which selected the proposed action alternative. The proposed action alternative addressed the implementation of an adaptive approach to managing damage using multiple methods that are integrated together to meet the need for action.

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 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 Decision and FONSI was made for the preferred alternative in the EA (USFWS 2010).

1.6 AUTHORITY OF FEDERAL AND STATE AGENCIES

WS' Legislative Authority

WS is the Federal program authorized by law to reduce damage caused by 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)). The mission of the USDA/APHIS/WS program is to provide federal leadership in managing conflicts with wildlife. Wildlife Services' mission, developed through its strategic planning process (USDA 1999), is: 1) "to provide leadership in wildlife damage management in the protection of America's agricultural, industrial and natural resources, and 2) to safeguard public health and safety." WS recognizes that wildlife is an important public resource greatly valued by the American people. By its very nature, however, wildlife is a highly dynamic and mobile resource that can cause damage to agriculture and property, pose risks to human health and safety, and affect industrial and natural

resources. WS conducts programs of research, technical assistance and applied management to resolve problems that occur when human activity and wildlife conflict.

U.S. Fish and Wildlife Service Authority

The USFWS mission is to conserve, protect, and enhance fish and wildlife and 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 Migratory Bird Treaty Act (MBTA) and those that are listed as threatened or endangered 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 depredation orders that allow for the take of those migratory birds addressed in the orders when those bird species are causing or about to cause damage 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.

Connecticut Department of Energy and Environmental Protection

The Connecticut Department of Energy and Environmental Protection (CT DEEP) was established on July 1, 2011 with the consolidation of the Department of Environmental Protection, the Department of Public Utility Control, and energy policy staff from other areas of state government (CT DEEP 2012a). CT DEEP's authority in wildlife management is given under Volume 8, Title 26; Chapter 490, Sections 26-1 to 26-186a, and Chapter 495, Sections 26-303 to 26-316 of the General Statutes of Connecticut.

This legislation covers general provisions; licenses, permits and stamps generally; wildlife generally; fish; wild animals and threatened and endangered species. CT DEEP's authority to manage pesticides is given under the Connecticut Pesticide Control Act, Volume 8, Title 22a; Chapter 441, Sections 22a-46 to 22a-66z.

Connecticut Department of Agriculture

The mission of the Connecticut Department of Agriculture (CT DAG) is to foster a healthy economic, environmental and social climate for agriculture by developing, promoting and regulating agricultural businesses; protecting agricultural and aquaculture resources; enforcing laws pertaining to domestic animals; and promoting an understanding among the state's citizens of the diversity of Connecticut agriculture, its cultural heritage and its contribution to the state's economy. CT DAG's authority in agriculture is given under Volume 8, Title 22; Chapters 422 to 438d, Sections 22-1 to 22-457 of the General Statutes of Connecticut. Of particular importance is Section 22-26g which requires a permit for and regulates the use of noise making devices, such as propane exploders, acetylene exploders, carbide exploders, electronic noisemakers and similar noise-making devices to disperse wildlife damaging agricultural resources.

1.7 COMPLIANCE WITH LAWS AND STATUTES

National Environmental Policy Act

All federal actions are subject to the NEPA (Public Law 9-190, 42 U.S.C. 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 the 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 the 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 U.S.C. 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 U.S.C 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 conducted in this EA will be in compliance with the regulations of the MBTA, as amended.

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

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

Pursuant to the MBTA under 50 CFR 21.43, a depredation permit is not required to lethal 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. 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.

Bald and Golden Eagle Protection Act (16 USC 668)

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

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

Endangered Species Act

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 regarding T&E species in Connecticut in regards to bird damage management activities proposed 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 operationally by WS causes major ground disturbance, any physical destruction or damage to property, any alterations of property, wildlife habitat, or landscapes, nor involves the sale, lease, or transfer of ownership of any property. In general, such methods also do not have the potential to introduce visual, atmospheric, or audible elements to areas in which they are used that could result in effects on the character or use of historic properties. Therefore, the methods that would be used by WS under the proposed action are not generally the types of activities that would have the potential to affect historic properties. If an individual activity with the potential to affect historic resources is planned under an alternative selected as a result of a decision on this EA, the site-specific consultation as required by Section 106 of the NHPA would be conducted as necessary.

Noise-making methods, such as firearms, that are used at or in close proximity to historic or cultural sites for the purposes of hazing or removing nuisance wildlife have the potential for audible effects on the use and enjoyment of historic property. However, such methods would only be used at a historic site at the request of the owner or manager of the site to resolve a damage problem, which means such use, would be to the benefit of the historic property. A built-in mitigating factor for this issue is that virtually all the methods involved would only have temporary effects on the audible nature of a site and can be ended at any time to restore the audible qualities of such sites to their original condition with no further adverse effects. Site-specific consultation as required by the Section 106 of the NHPA would be conducted as necessary in those types of situations.

Environmental Justice - Executive Order 12898

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

Protection of Children - Executive Order 13045

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

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

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

Invasive Species - Executive Order 13112

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

The Native American Graves and Repatriation Act of 1990

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

Federal Insecticide, Fungicide, and Rodenticide Act

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

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

This law established a voluntary national program within the Department of Commerce to encourage coastal states to develop and implement coastal zone management plans. Funds were authorized for cost-sharing grants to states to develop their programs. Subsequent to federal approval of their plans, grants

would be awarded for implementation purposes. In order to be eligible for federal approval, each state's plan was required to define boundaries of the coastal zone, identify uses of the area to be regulated by the state, determine the mechanism (criteria, standards or regulations) for controlling such uses, and develop broad guidelines for priorities of uses within the coastal zone. In addition, this law established a system of criteria and standards for requiring that federal actions be conducted in a manner consistent with the federally approved plan. The standard for determining consistency varied depending on whether the federal action involved a permit, license, financial assistance, or a federally authorized activity. 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 United States Food and Drug Administration (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. Alpha-chloralose as a method for resolving waterfowl damage and threats to human safety are 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.

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 minimization measures and/or standard operating procedures (SOP), 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 mitigation measures. Additional descriptions of affected environments will be incorporated into the discussion of the environmental effects in Chapter 4.

2.1 AFFECTED ENVIRONMENT

Upon receiving a request for assistance, bird damage management activities could be conducted on federal, state, tribal, municipal, and private properties in Connecticut. The areas of the proposed action could include 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, but are not necessarily limited to: agricultural fields, vineyards, orchards, farmyards, dairies, livestock operations, aquaculture facilities, fish hatcheries, railroad yards, waste handling facilities, landfills, industrial sites, natural areas, government properties and facilities, private properties, corporate properties, schools, hospitals, parks, woodlots, recreation areas, communally-owned homeowner/property owner association properties, wildlife refuges, wildlife management areas, military bases, and airports.

2.1.1 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 will 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, invasive species, or unprotected wildlife species.

Wildlife species, such as most native 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 includes the allowable length of hunting seasons, methods of take, and allowed take which are implemented by the CT DEEP. 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. However, Title 26, Chapter 490, Section 26-92 entitled "wild birds other than game birds protected, exception, game birds defined" only specifically authorizes take of crows and brown-headed cowbirds be taken when found depredating ornamental trees, agriculture crops, livestock or wildlife, or when concentrated in such numbers as to constitute a public health or public safety hazard. It does not include common grackles, red-winged blackbirds or the other species listed in the depredation order. As a result, take of common grackles, red-winged blackbirds or other blackbird species listed on the depredation order would require either a Connecticut state permit or a USFWS migratory bird depredation permit.

Pursuant to the MBTA, the USFWS can issue depredation permits to those entities experiencing damage associated with birds, when deemed appropriate. When a non-federal entity (*e.g.*, agricultural producers, health agencies, municipalities, counties, private companies, individuals, or any other non-federal entity) takes a bird damage management action, the action is not subject to compliance with the NEPA due to the lack of federal involvement[5] 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 will occur and even the particular methods that will be used, WS' involvement in the action will not affect the environmental status quo. WS' involvement will not change the environmental status quo if the requestor would have 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, or through the issuance of depredation permits by the USFWS and CT DEEP 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 two alternatives. WS can either 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 will take the action anyway either without a permit, during the hunting season, under depredation orders, or through the issuance of a depredation permit by the USFWS. Under those circumstances, WS

[5]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.

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 conducts activities involving species not afforded protection from take, under the regulated harvest season, under depredation orders, or under depredation permits 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 the action will 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 with regards to effectiveness, humaneness, minimizes non-target take, and reduces threats to human safety from those methods. WS' mission is to provide leadership in resolving and preventing damage to resources and to reduce threats to human safety caused by wildlife, including birds in Connecticut. Thus, in those situations, WS' involvement may actually have a beneficial effect on 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 relating to the reduction of wildlife damage were raised during the scoping process and were considered in the preparation of this EA. Those issues identified in the cormorant management FEIS developed by the USFWS, in cooperation with WS, were also reviewed and considered during the development of this EA. Issues related to managing damage associated with birds in Connecticut were developed by WS in consultation with the USFWS and the CT DEEP. The EA will also be made available to the public for review and comment to identify additional issues.

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

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

A common issue when addressing damage caused by wildlife are the potential impacts of management actions on the populations of target species. Methods used to resolve damage or threats to human safety can involve altering the behavior of target species and may require the use of lethal methods when appropriate. Non-lethal methods 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 are employed. Lethal methods would be employed to remove a bird or those birds responsible for causing damage or posing threats to human safety. The use of lethal methods would therefore result in local population reductions in the area where damage or threats were occurring. The number of target species removed from the population using lethal methods under the alternatives would be dependent on the

number of requests for assistance received, the number of individuals involved with the associated damage or threat, and the efficacy of methods employed.
The analysis for magnitude of impact on populations from the use of lethal methods would be based on a measure of the number of animals killed in relation to their 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 of animals killed with overall populations or trends in populations to assure the magnitude of take was maintained below the level that would cause significant adverse effects to the viability of a native species population. Under the alternatives where lethal methods could be employed or recommended, the lethal take (killing) of birds would only occur at the request of a cooperator seeking assistance and only after the take of those species identified as targets had been permitted by the relevant state and federal agencies, when required.

2.2.2 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. Methods available for use under the alternatives are described in Appendix B.

Concerns have also been raised about the potential for adverse effects to occur to non-target wildlife from the use of registered toxicants. Chemical methods being considered for use to manage damage and threats associated with birds in Connecticut are further discussed in Appendix B. Chemical methods considered for use to manage damage or threat associated with birds includes the avicide DRC-1339, Avitrol, alpha-chloralose, mesurol, nicarbazin, and taste repellents.

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 and to facilitate interagency cooperation, WS consulted with the USFWS under Section 7 during the development of this EA which is further discussed in Chapter 4.

2.2.3 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. 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 are also an issue. WS' employees are potentially exposed to damage management methods as well as subject to workplace accidents.

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, alpha-chloralose, 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. 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, 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. Alpha-chloralose, a sedative, is also being considered as a method that could be employed under the alternatives to manage damage associated with waterfowl. Nicarbazin is the only reproductive inhibitor currently registered with the EPA for use to manage populations of waterfowl by reducing or eliminating the hatchability of eggs laid. 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 NCDACS, and by WS Directives[6].

Most methods available to alleviate damage and threats associated with birds are considered non-chemical methods. Non-chemical methods may include cultural methods, limited habitat modification, animal behavior modification, and other mechanical methods. Changes in cultural methods could include improved animal husbandry practices, altering feeding schedules, changes in crop rotations, or conducting structural repairs. Limited habitat modification would be practices that alter specific characteristic of a localized area, such as pruning trees to discourage birds from roosting or planting vegetation that are less palatable to birds. Animal behavior modification methods would include those methods designed to disperse birds from an area through harassment or exclusion. Behavior modification methods could include pyrotechnics, propane cannons, bird-proof barriers, electronic distress calls, effigies, Mylar tape, lasers, eye-spot balloons, or nest destruction. Other mechanical methods could include live-traps, mist nests, cannon nets, shooting, or the recommendation that a local population of birds be reduced through the use of hunting.

The primary safety risk of most non-chemical methods occurs directly to the applicator or those 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 Connecticut 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.

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.

[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.

Additional concern is raised with inadequately addressing threats to human safety associated with aircraft striking birds at airports in the State. Birds have the potential to cause severe damage to aircraft and can threaten the safety of passengers. Limiting or preventing the use of certain methods to address the potential for aircraft striking birds could lead to higher risks to passenger safety. This issue will be fully evaluated in Chapter 4 in relationship to the alternatives.

2.2.4 Issue 4 - Effects on the Aesthetic Values of Birds

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

The human attraction to animals has been well documented throughout history and started when humans began domesticating animals. The American public shares a similar bond with animals and/or wildlife in general and in modern societies a large percentage 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 and may take the form of 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 relocated to another area to alleviate damage or threats to protected resources. Some people directly affected by the problems caused by wildlife strongly support removal. Individuals not directly affected by the harm or damage may be supportive, neutral, or totally opposed to any removal of wildlife from specific locations. Some people totally opposed to wildlife damage management want agencies to teach tolerance for damage and threats caused by wildlife, and that wildlife should never be killed. Some of the people who oppose removal of wildlife do so because of human-affectionate bonds with individual wildlife. Those human-affectionate bonds are similar to attitudes of a pet owner and result in aesthetic enjoyment.

The effects on the aesthetic value of birds from implementation of the identified alternatives, including the proposed action, are analyzed in Chapter 4.

2.2.5 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). Additionally, 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 it relates to the methods available for use under the alternatives in Chapter 4.

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

Another issue commonly identified is a concern that bird 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 that are addressed in this EA that also can be hunted during regulated seasons in the State include: American crows, fish crows, wild turkeys, ring-necked pheasants, ruffed grouse, bobwhite quails, snow geese, Atlantic brant, mute swans, wood ducks, gadwalls, American wigeons, American black ducks, mallards, blue-winged teals, Northern shovelers, Northern pintails, green-winged teals, canvasbacks, redheads, ring-necked ducks, greater scaups, lesser scaups, common eiders, surf scoters, white-winged scoters, black scoters, long-tailed ducks, buffleheads, common goldeneyes, hooded mergansers, common mergansers, red-breasted mergansers, ruddy ducks, Wilson's snipe, woodcocks, and American coot.

Potential impacts could arise from the use of non-lethal or lethal damage management methods. Non-lethal methods used to reduce or alleviate damage caused by those birds species are used to reduce bird densities through dispersal in areas where damage or the threat of damage is occurring. Similarly, lethal methods used to reduce damage associated with those birds could lower densities in areas where damage is occurring resulting in a reduction in the availability of those species during the regulated harvest season.

2.3 ISSUES CONSIDERED BUT NOT IN DETAIL WITH RATIONALE

Additional issues were also identified by WS, the CT DEEP, and the USFWS during the scoping process of this EA that were considered but will not receive detailed analyses for the reasons provided. The following issues were considered but will not be analyzed in detail:

2.3.1 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 Connecticut 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 will occur, the program cannot predict the specific locations or times at which affected resource owners will determine a damage problem has become intolerable to the point that they request assistance from WS.

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 will provide a more comprehensive and less redundant analysis than multiple EAs covering smaller areas. If a determination is made through this EA that the proposed action 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 Connecticut would continue to conducted bird damage management in a very small area of the State where damage is occurring or likely to occur.

2.3.2 WS' Impact on Biodiversity

The WS program does not attempt to eradicate any species of native wildlife in the State. WS operates in accordance with international, 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 is frequently temporary because immigration from adjacent areas or reproduction replaces the animals removed. WS operates on a small percentage of the land area of Connecticut and only targets those birds identified as causing damage or posing a threat. Therefore, bird damage management activities conducted pursuant to any of the alternatives will not adversely affect biodiversity in the State.

2.3.3 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 that a forest supervisor needs only show that damage from wildlife is 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 wildlife damage management actions.

2.3.4 Bird Damage Management Should Not Occur at Taxpayer Expense

Funding for bird damage management activities is derived from federal appropriations and through cooperative funding. Activities conducted in the State for the management of damage and threats to human safety from birds will be funded through cooperative service agreements with individual property owners or associations. A minimal federal appropriation is allotted for the maintenance of a WS program in Connecticut. 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 agreements between the requester and WS.

2.3.5 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 will receive the greatest application. As part of an integrated approach, evaluation of methods will continually occur to allow

for those methods that are most effective at resolving damage or threats to be employed under similar circumstance 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 in the following issue.

2.3.6 Effectiveness of Bird Damage Management Methods

The effectiveness of any damage management program could be defined in terms of losses or risks potentially reduced or prevented, how accurately practitioner's diagnosis the problem, the species responsible for the damage, and how actions are implemented to correct or mitigate risks or damages. To determine that effectiveness, WS must be able to complete management actions expeditiously to minimize harm to non-target animals and the environment, while at the same time, using methods as humanely as possible. The most effective approach to resolving any wildlife damage problem is to use an adaptive integrated approach which may call for the use of several management methods simultaneously or sequentially (Courchamp et al. 2003).

The goal is to reduce damage, risks, and conflicts with wildlife as requested and not to necessarily reduce/eliminate populations. Localized population reduction could be short-term and new individuals may immigrate or be born to animals remaining at the site (Courchamp et al. 2003). The ability of an animal population to sustain a certain level of removal and to eventually return to pre-management levels, however, does not mean individual management actions are unsuccessful, but that periodic management may be necessary. The return of wildlife to pre-management levels also demonstrates that limited, localized damage management methods have minimal impacts on species' populations.

Therefore, any method that disperses or removes birds from areas will only be temporary if preferred characteristics continue to exist the following year when birds return. Dispersing birds using non-lethal methods addressed in Appendix B often requires repeated application to discourage birds from returning to locations which increases costs, moves birds to other areas where they could cause damage, and are temporary if conditions where damage was occurring remains unchanged. Dispersing and the relocating of birds could be viewed as moving a problem from one area to another which would require addressing damage caused by those birds at another location which increases costs and could be perceived as creating a financial incentive to continue the use of those methods since birds will have to be addressed annually and at multiple locations. WS' recommendation of or use of techniques to modify existing habitat or making areas unattractive to birds is discussed in Appendix B. WS' objective is to respond to request for assistance with the most effective methods and to provide for the long-term solution to the problem using WS' Decision Model to manage bird damage.

Managing damage caused by birds can be divided into short-term redistribution approaches and long-term population and habitat management approaches (Cooper and Keefe 1997). Short-term approaches focus on redistribution and dispersal of birds to limit use of an area where damage or threats were occurring. Short-term redistribution approaches may include prohibiting feeding, the use of pyrotechnics, propane cannons, effigies, and other adverse noise, erecting access barriers such as wire grids, and taste aversion chemicals (Cooper and Keefe 1997). Population reduction by limiting survival or reproduction, removing birds, and habitat modification are considered long-term solutions to managing damage caused by birds (Cooper and Keefe 1997).

Redistribution methods are often employed to provide immediate resolution to damage occurring until long-term approaches can be implemented or have had time to reach the desired result.

Dispersing birds are often short-term solutions that move birds to other areas where damages or threats could occur (Smith et al. 1999, Gorenzel et al. 2000, Gorenzel et al. 2002, Avery et al. 2008, Chipman et al. 2008). Chipman et al. (2008) found that crows could be dispersed from roost locations using non-lethal methods but crows would return to the original roost site within 2 to 8 weeks. The re-application of non-lethal methods to disperse crow roosts was required every year to disperse crows from the original roost or from roosts that had formed in other areas where damages were occurring (Chipman et al. 2008). Some short-term methods may become less effective in resolving damage as a bird population increases, as birds become more acclimated to human activity, and as birds become habituated to harassment techniques (Smith et al. 1999, Chipman et al. 2008). Non-lethal methods often require a constant presence at locations when birds are present and must be repeated every day until the desired results are achieved which can increase the costs associated with those activities. Long-term solutions to resolving bird damage often require management of the population (Smith et al. 1999) and identifying the characteristics which attract birds to a particular location (Gorenzel and Salmon 1995).

Based on the evaluation of the damage situation, the most effective methods will be employed individually or in combination based on the prior evaluations of methods or combinations of methods in other damage management situations. Once employed, methods will be further evaluated for effectiveness based on a continuous evaluation of activities by WS. Therefore, the effectiveness of methods is considered as part of the decision making-process under WS' use of the Decision Model described in Chapter 3 for each damage management request based on continual evaluation of methods and results.

2.3.7 Impacts of Avian Influenza (AI) on Bird Populations

AI is caused by a virus in the Orthomyxovirus group. Viruses in this group vary in the intensity of illness they may cause (virulence). Wild birds, in particular waterfowl and shorebirds, are considered to be the natural reservoirs for AI (Clark and Hall 2006). Most strains of AI rarely cause severe illness or death in birds although the H5 and H7 strains tend to be highly virulent and very contagious. However, even the strains which do not cause severe illness in birds are a concern for human and animal health officials because the viruses have the potential to become virulent and transmissible to other species through mutation and re-assortment (Clark and Hall 2006).

Recently, the occurrence of highly pathogenic (HP) H5N1 AI virus has raised concern regarding the potential impact on wild birds, domestic poultry, and human health should it be introduced into the United States. It is thought that a change occurred in a low pathogenicity AI virus of wild birds, allowing the virus to infect chickens, followed by further change into the HP H5N1 AI. HP H5N1 AI has been circulating in Asian poultry and fowl resulting in death to those species. HP H5N1 AI likely underwent further change allowing infection in additional species of birds, mammals, and humans. More recently, this virus moved back into wild birds resulting in mortality of some species of waterfowl, and other birds. This is only the second time in history that the HP form of AI has been recorded in wild birds. Numerous potential routes for introduction of the virus into the United States exist including: illegal movement of domestic or wild birds, contaminated products, infected travelers, and the migration of infected wild birds. WS has been one of several agencies and organizations conducting surveillance for AI virus in migrating birds. The nationwide surveillance effort has detected some instances of low pathogenic AI viruses, as was expected given that waterfowl and shorebirds are considered to be the natural reservoirs for AI. Tens of thousands of birds have been tested, but there has been no evidence of the HP H5N1 virus in North America. Currently, there is no evidence to suggest AI has negatively affected bird populations in North America. As stated previously, most strains of AI do not cause severe illnesses or death in bird populations.

2.3.8 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 or 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 contract with a government agency. In particular, large industrial businesses and cities and towns may prefer to use WS because of security and safety issues and reduced administrative burden.

2.3.9 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 will only use non-toxic shot as defined in 50 CFR 20.21(j) when using shotguns to take all migratory birds.

The take of birds by WS in the State occurs primarily from the use of shotguns. However, the use of rifles and air rifles could be employed to lethally take some species. To reduce risks to human safety and property damage from bullets passing through birds, the use of rifles and air rifles is applied in such a way (*e.g*., caliber, bullet weight, distance) to maximize the probability that the bullet does not pass through birds, and if the bullet does pass through or misses the target, it impacts in a safe location. Birds that are removed using rifles and air rifles will occur within areas where retrieval of all bird carcasses for proper disposal is highly likely (*e.g.,* at roost sites). With risks of lead exposure occurring primarily from ingestion of bullet fragments, the retrieval and proper disposal of bird carcasses will 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 or air 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 water, 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 where it was believed the lead contamination was due to runoff from the parking 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 naturally 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.

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 will be retrieved and disposed of properly to limit the availability of lead in the environment and ensures bird carcass are 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 are 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. Additionally, WS may utilize non-toxic rifle and air rifle ammunition as the technology improves and these rounds become more effective and available.

2.3.10 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 can 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, on the whole, 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 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 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 for 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.

2.3.11 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 which 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. Minimization measures and SOPs for bird damage management in Connecticut are also discussed in Chapter 3.

3.1 DESCRIPTION OF THE ALTERNATIVES

The alternatives developed to address the issues identified in Chapter 2 include:

3.1.1 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 Connecticut. To meet the goal stated in the EA, WS, in consultation the USFWS and the CT DEEP would continue to respond to requests for assistance with, at a minimum, technical assistance, or when funding is available, operational damage management. 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, threats of damage or threats to human health and safety for each request. City/town managers, agricultural producers, resource managers, property owners, and others requesting assistance would be provided information regarding the use of appropriate non-lethal and lethal techniques. WS will work with those persons experiencing bird damage in addressing those birds responsible for causing damage as expeditiously as possible.

Non-lethal methods include, but are not limited to: habitat/behavior modification, nest/egg destruction, lure crops, visual deterrents, live traps, exclusionary devices, frightening devices, alpha-chloralose, reproductive inhibitors, and chemical 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, Avitrol, lethal trapping, and shooting. Euthanasia would occur through the use of cervical dislocation, carbon dioxide, or through injectable euthanasia drugs once birds are live-captured using other methods. Carbon dioxide and euthanasia drugs are acceptable forms of

euthanasia for birds while cervical dislocation is a conditionally acceptable[7] method of euthanasia (AVMA 2007). The use of firearms could also be used to euthanize birds live-captured and is considered a conditionally acceptable method for wildlife (AVMA 2007).

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 which are addressed further below and in Appendix B.

Non-lethal methods can disperse or otherwise make an area unattractive to birds causing damage thereby, reducing the presence of birds at the site and potentially the immediate area around the site where non-lethal methods are employed. Non-lethal methods would be given priority when addressing requests for assistance (WS Directive 2.101). However, non-lethal methods would not necessarily be employed to resolve every request for assistance if deemed inappropriate by WS' personnel using the WS Decision Model.

Lethal methods would be employed to resolve damage associated with those birds identified by WS as responsible for causing damage or threats to human safety only after receiving approval for the use of those methods. Lethal methods are often employed to reinforce non-lethal methods and to remove birds that have been identified as causing damage or posing a threat to human safety. The number of birds removed from the population using lethal methods under the proposed action would be dependent on the number of requests for assistance received, the number of birds involved with the associated damage or threat, and the efficacy of methods employed.

Although the use of firearms can reduce the number of birds using a location (similar to dispersing birds), the use of a firearm is most often used to supplement and reinforce the noise associated with non-lethal methods. The capture of birds using live-traps and subsequently euthanizing those birds is employed to reduce the number of birds using a particular area where damage is occurring. Live capture also supplements and reinforces non-lethal methods due to the distress calls from the captured birds and some live-capture methods. Similarly, the recommendation that birds be harvested during the regulated hunting season for those species in the State is intended to manage those populations in an area where damage is occurring.

Often of concern with the use of lethal methods is that birds that are lethally taken will only be replaced by other birds either during the application of those methods (either from other birds that immigrate or emigrate into the area) or by birds the following year (increase in reproduction that could result from less competition). As stated previously, the use of lethal methods are not intended to be used as population management tools (except for hunting) over broad areas. The use of lethal methods are intended to reduce the number of birds present at a location where damage is occurring by targeting those birds causing damage or posing threats. Since the intent of lethal methods is to manage those birds causing damage and not to manage entire bird populations, those methods are not ineffective because birds return the following year.

Long-term solutions involve exclusionary devices, such as wire grids, or other practices which modifying existing habitat or make conditions to be less attractive to birds.

[7]The AVMA (2007) 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".*

WS may recommend birds be harvested during the regulated hunting season for those species in an attempt to reduce the number of birds causing damage. Managing bird populations over broad areas could lead to a decrease in the number of birds causing damage. Establishing hunting seasons and the allowed take during those seasons is the responsibility of the CT DEEP under frameworks developed by the USFWS. WS does not have the authority to establish hunting seasons or to set allowed harvest numbers during those seasons.

A complete list of chemical and non-chemical methods available for use under the identified alternatives, except the alternative with no damage management (Alternative 3), can be found in Appendix B. However, listing methods neither implies that all methods will be used by WS to resolve requests for assistance nor does the listing of methods imply that all methods will be used to resolve every request for assistance.

Technical Assistance Recommendations

Technical assistance as used herein is information, demonstrations, and advice on available and appropriate wildlife damage management methods and approaches. The WS program in the State 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.

Under APHIS NEPA implementing regulations and specific guidance for the WS program, WS technical assistance is categorically excluded from the need to prepare an EA or EIS. However, it is discussed in this EA because it is an important component of the IWDM approach to resolving mammal damage problems.

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 effectively resolve problems, especially if restricted-use chemicals are necessary or if the problems are complex.

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 cooperate 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 wildlife 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 world-wide for their expertise in wildlife damage management.

WS' Decision Making Procedures

WS' personnel use a thought process for evaluating and responding to damage complaints which is depicted by the WS Decision Model (WS Directive 2.201) and described by Slate et al. (1992) (Figure 3-1). 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 to be practical for the situation are incorporated into a damage management strategy. After this strategy has been implemented, monitoring is conducted and evaluation continues to assess the effectiveness of the strategy. If the strategy is effective, the need for further management is ended. In terms of the WS Decision Model, most damage management efforts consist of continuous feedback between receiving the request and monitoring the results of the damage management strategy. The Decision Model is not a written documented process, but a mental problem-solving process common to most, if not all, professions, including WS.

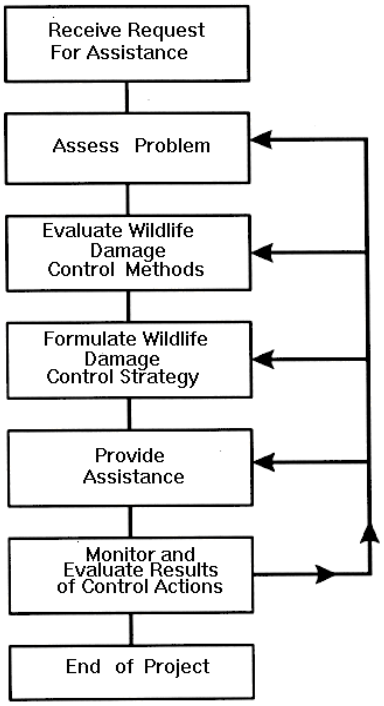


Figure 3.1 WS Decision Model as presented by Slate et al. (1992) for developing a strategy to respond to a request for assistance with human-wildlife conflicts.

Community-based Decision Making

The WS program in Connecticut under this alternative would follow 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 in the State 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.

Community Decision-Makers

The decision-maker for the local community with a homeowner or civic association would be the President or the Board's appointee. The President and Board are popularly elected residents of the local community who oversee the interests and business of the local community. This person would represent the local community's interest and make decisions for the local community or bring information back to a higher authority or the community for discussion and decision-making. If no homeowner or civic association represents the affected resource then WS could provide technical assistance to the self or locally appointed decision-maker. Identifying the decision-maker for local business communities is more complex because the lease may not indicate whether the business must manage wildlife damage themselves, or seek approval to manage wildlife from the property owner or manager, or from a governing Board. WS could provide technical assistance and make recommendations for damage reduction to the local community or local business community decision-maker(s). Direct control could be provided by WS only if requested by the local community decision-maker, funding is provided, and if the requested direct control was compatible with WS' recommendations.

Private Property Decision-Makers

In the case of private property owners, the decision-maker is the individual that owns or manages the affected property. The decision-maker has the discretion to involve others as to what occurs or does not occur on property they own or manage. Due to privacy issues, WS cannot disclose cooperator information to others. Therefore, in the case of an individual property owner or manager, the involvement of others and to what degree others are involved in the decision-making process is a decision made by that individual. Direct control could be provided by WS if requested, funding is provided, and the requested management was according to WS' recommendations.

Public Property Decision-Makers

The decision-maker for local, state, or federal property would be the official responsible for or authorized to manage the public land to meet interests, goals, and legal mandates for the property. WS could provide technical assistance to this person and recommendations to reduce damage. Direct control could be provided by WS if requested, funding provided, and the requested actions were within the recommendations made by WS.

3.1.2 Alternative 2 - Bird Damage Management by WS through Technical Assistance Only

Under this alternative, WS would provide those cooperators requesting assistance with managing damage and threats associated with birds with technical assistance only. Technical assistance could provide those cooperators experiencing damage or threats associated with birds with information, demonstrations, and recommendations on available and appropriate methods available. The implementation of methods and techniques to resolve or prevent damage would be the responsibility of the requester with no direct involvement by WS. In some cases, WS may provide supplies or materials that are of limited availability for use by private entities. Technical assistance may be provided through a personal or telephone consultation, or during an on-site visit with the requester. Generally, several management strategies are described to the requester for short and long-term

solutions to managing damage; these strategies are based on the level of risk, need, and the practicality of their application. In some instances, wildlife-related information provided to the requestor results in tolerance/acceptance of the situation. In other instances, damage management options are discussed and recommended. Only those methods legally available for use by the appropriate individual would be recommend or loaned by WS. Similar to Alternative 1, those methods described in Appendix B would be available to those experiencing damage or threats associated with birds in the State except for alpha-chloralose, DRC-1339, and mesurol which are only available to WS.

This alternative would place the immediate burden of operational damage management work on the resource owner, other governmental agencies, and/or private businesses. Those persons experiencing damage or threats could take action using those methods legally available to resolve or prevent bird damage as permitted by federal, state, and local laws and regulations or those persons could take no action.

3.1.3 Alternative 3 – No Bird Damage Management Conducted by WS

This alternative would preclude any and all activities by WS to reduce threats to human health and safety, and to alleviate damage to agricultural resources, property, and natural resources. WS would not be involved with any aspect of bird damage management in the State. All requests for assistance received by WS to resolve damage caused by birds could be referred to the USFWS and/or the CT DEEP.

Despite no involvement by WS in resolving damage and threats associated with birds in the State, those persons experiencing damage caused by birds could continue to resolve damage by employing those methods legally available since the take of birds can occur despite the lack of involvement by WS. The take of birds could occur through the issuance of depredation permits by the USFWS and the CT DEEP, during the hunting seasons, blackbirds and cormorants can be taken without the need for a depredation permit under depredation orders, and non-native bird species can 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 experiencing damage or threats except for the use of alpha-chloralose, DRC-1339, and mesurol which can only be used by WS.

3.2 ALTERNATIVES CONSIDERED BUT NOT ANALYZED IN DETAIL WITH RATIONALE

3.2.1 Non-lethal Methods Implemented 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 in the State. 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 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 the EA.

3.2.2 Use of Non-lethal Methods Only by WS

Under this alternative, WS would be required to implement non-lethal methods only to resolve damage caused by birds in Connecticut. Only those methods discussed in Appendix B that are considered non-lethal would be employed by WS. No lethal take of birds would occur by WS. The use of lethal methods could continue to be used under this alternative by those persons experiencing damage by birds. The non-lethal methods used or recommended by WS under this alternative would be identical to those identified in any of the alternatives.

In situations where non-lethal methods were impractical or ineffective to alleviate damages, WS could refer requests for information regarding lethal methods to the CT DEEP, the USFWS, local animal control agencies, or private businesses or organizations. Under this alternative, however, property owners/managers might be limited to using non-lethal methods only as they may have difficulty obtaining permits for lethal methods, especially in urban areas.

Property owners or managers could conduct management using shooting or any non-lethal method that is legal. Property owners or managers might choose to implement WS' non-lethal recommendations, implement lethal methods, or request assistance from a private or public entity other than WS. Property owners/managers frustrated by lack of WS' assistance with the full range of bird damage management techniques may try methods not recommended by WS or use illegal methods (*e.g.*, poisons). In some cases, property owners or managers may misuse some methods or use some methods in excess of what is necessary which could then become hazardous and pose threats to the safety of humans and non-target species.

The proposed action, using an integrated damage management approach, incorporates the use of non-lethal methods when addressing requests for assistance. In those instances where non-lethal methods would effectively resolve damage from birds those methods would be used or recommended under the proposed action. Since non-lethal methods would be available for use under the alternatives analyzed in detail, this alternative would not add to the analyses.

3.2.3 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. 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.

3.2.4 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 nests. 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 CT DEEP, 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. When authorized by the USFWS and/or the CT DEEP, WS could translocate birds only under Alternative 1. Since WS does not have the authority to translocate birds in the State unless permitted by the USFWS and/or the CT DEEP, this alternative was not considered in detail.

The translocation of birds to other areas following live-capture that have caused damage 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. Also, hundreds or thousands of birds would need to be captured and translocated to solve some damage problems (*e.g.*, urban crow 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).

3.2.5 Reducing Damage by Managing Bird Populations through the Use of Reproductive Inhibitors

Under this alternative, the only method available to resolve requests for assistance would be the recommendation and the use of reproductive inhibitors to reduce or prevent reproduction in birds responsible for causing damage. Reproductive inhibitors are often considered for use where wildlife populations are overabundant and where traditional hunting or lethal control programs are not publicly acceptable (Muller et al. 1997). Use and effectiveness of reproductive control as a wildlife population management tool is limited by population dynamic characteristics (*e.g.*, longevity, age at onset of reproduction, population size and biological/cultural carrying capacity), habitat and environmental factors (*e.g.*, isolation of target population, cover types, and access to target individuals), socioeconomic, and other factors.

Reproductive control for wildlife could be accomplished either through sterilization (permanent) or contraception (reversible). Sterilization could be accomplished through: 1) surgical sterilization (vasectomy, castration, and tubal ligation), 2) chemosterilization, and 3) through gene therapy. Contraception could be accomplished through: 1) hormone implantation (synthetic steroids such as progestins), 2) immunocontraception (contraceptive vaccines), and 3) oral contraception (progestin administered daily).

Population modeling indicates that reproductive control is more efficient than lethal control only for some rodent and small bird species with high reproductive rates and low survival rates (Dolbeer 1998). Additionally, the need to treat a sufficiently large number of target animals, multiple treatments, and population dynamics of free-ranging populations place considerable logistic and economic constraints on the adoption of reproduction control technologies as a wildlife management tool for some species. Currently, no reproductive inhibitors are available for use to manage most bird populations. Given the costs associated with live-capturing and performing sterilization procedures on birds and the lack of availability of chemical reproductive inhibitors for the management of most bird populations, this alternative was not evaluated in detail. If a reproductive inhibits becomes available to manage a large number of bird populations and has proven effective in reducing localized bird populations, the use of the inhibitor could be evaluated under the proposed action as a method available that could be used in an integrated approach to managing damage. This EA would be reviewed and supplement to the degree necessary to evaluate the use of the reproductive inhibitor as part of an integrated approach described under the proposed action. Currently the only reproductive inhibitor available in Connecticut currently is the formulation of nicarbazin to manage pigeon

populations. Reproductive inhibitors for the other bird species addressed in this EA do not currently exist.

3.2.6 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. 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) compensation most likely would 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. Therefore, this alternative was not evaluated in detail.

3.3 MINIMIZATION MEASURES AND SOPs FOR BIRD DAMAGE MANAGEMENT

Minimization measures are any features of an action that serves to prevent, reduce, or compensate for impacts that otherwise might result from that action. The current WS program, nationwide and in the State of Connecticut, uses many such minimization. Those minimization measures will be incorporated into activities conducted by WS when addressing bird damage and threats in the State.

Some key minimizing measures 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, is consistently used and applied when addressing bird damage.
- EPA-approved label directions are 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.
- Non-target animals captured in traps are released unless it is determined that the animal would not survive and/or that the animal cannot be released safely.
- The presence of non-target species is monitored before using DRC-1339 to reduce the risk of mortality of non-target species populations.
- Reasonable and prudent alternatives and measures are established through consultation with the USFWS and CT DEEP and are implemented to avoid adverse impacts to T&E species.
- All personnel who use chemicals are trained and certified to use such substances or are supervised by trained or certified personnel.
- All personnel who use firearms are trained according to WS' Directives.
- The use of non-lethal methods is considered prior to the use of lethal methods when managing bird damage.
- WS employs methods and conducts activities for which the risk of hazards to public safety and hazard to the environment have been determined to be low. Where such activities are conducted

on private lands or other lands of restricted public access, the risk of hazards to the public is even further reduced.

- Only non-toxic shot will be used when employing shotguns to lethally take birds species in the State.

- The take of bird will only occur when authorized by the USFWS and the CT DEEP, when applicable, and only at levels authorized.

3.4 ADDITIONAL MINIMIZATION MEASURES SPECIFIC TO THE ISSUES

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

- Lethal take of birds by WS will be reported and monitored by WS, by the USFWS, and by the CT DEEP to evaluate population trends and the magnitude of WS' take of birds in the State.

- WS will only target those individuals or groups of target species identified as causing damage or posing a threat to human safety.

- The WS' Decision Model, designed to identify the most appropriate damage management strategies and their impacts, will be used to determine bird damage management strategies.

- WS will annually monitor bird damage management activities to ensure activities do not adversely affect bird populations in the State.

- Preference is 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 or to recommend, WS may implement or recommend lethal methods.

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

- When conducting removal operations via shooting, identification of the target will occur prior to application.

- As appropriate, suppressed firearms will be used to minimize noise impacts.

- Personnel will use lures, 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 will be released whenever it is possible and safe to do so.

- Personnel will be present during the use of live-capture methods or live-traps will be checked frequently to ensure non-target species are released immediately or are prevented from being captured.

- WS would retrieve all dead birds to the extent possible following treatment with DRC-1339.

- WS has consulted with the USFWS and the CT DEEP to evaluate activities to resolve bird damage and threats to ensure the protection of T&E species.

- WS will annually monitor activities conducted under the selected alternative, if activities are determined to have no significant impact on the environment and an EIS is not required, to ensure those activities do not negatively impact non-target species.

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

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

- Shooting will be conducted during time periods when public activity and access to the control areas are restricted. Personnel involved in shooting operations will be fully trained in the proper and safe application of this method.

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

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

3.4.4 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.

- Preference is 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 or recommend, WS may implement or recommend those lethal methods.

3.4.5 Issue 5 - Humaneness and Animal Welfare Concerns of Methods

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

- WS' use of euthanasia methods will follow those recommended by WS' directives (WS Directive 2.430) and the AVMA (AVMA 2007).

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

- The use of non-lethal methods is considered prior to the use of lethal methods when managing bird damage.

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

- Management actions to reduce or prevent damage caused by birds in the State 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.

- WS' activities to manage damage and threats caused by birds will be coordinated with the USFWS and the CT DEEP.

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

- WS will annually monitor bird damage management activities to ensure activities do not adversely affect bird populations in the State.

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 in relation to the issues identified. The following resource values in the State are not expected to be significantly impacted by any of the alternatives analyzed: soils, geology, minerals, water quality/quantity, flood plains, wetlands, critical habitats (areas listed in T&E species recovery plans), visual resources, air quality, prime and unique farmlands, aquatic resources, timber, and range. These resources will not be analyzed further.

4.1 ENVIRONMENTAL CONSEQUENCES FOR ISSUES ANALYZED IN DETAIL

This section analyzes the environmental consequences of each alternative in comparison to determine the extent of actual or potential impacts on the issues. Therefore, 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 CT DEEP, the USFWS, and the NCDACS.

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

As discussed previously, the analysis for magnitude of impact from lethal take can be determined either quantitatively or qualitatively. Information on bird populations and trends are often derived from several sources including the BBS, the CBC, the Partners in Flight Landbird Population database, published literature, and harvest data.

Breeding Bird Survey
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 U.S. Geological Survey, Patuxent Wildlife Research Center (Sauer et al. 2011). The BBS is a combined set of 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, as a result of variable local habitat and climatic conditions. Trends can be determined using different population equations and statistically tested to determine if a trend is statistically significant.

Estimates of population trends from BBS data are derived primarily from route-regression analysis (Geissler and Sauer 1990) and are dependent upon a variety of assumptions (Link and Sauer 1998). The statistical significance of a trend for a given species is reflected in the calculated P-value (*i.e.*, the probability of obtaining the observed data or more extreme data given that a hypothesis of no change is true). The level of statistical significance (*e.g.*, 0.01, 0.05, 0.10) can vary and is often set by those conducting the analysis. Often BBS or other geographically large survey data is not statistically significant at the local level because of relatively smaller sample size (*i.e.*, fewer routes surveyed), more routes with zero observations of a particular bird species which results in larger statistical variance and low P-values set for statistical significance. The data reported from the BBS has a statistical level of significance set at $P<0.01$.

Christmas Bird Count

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 and is based on 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 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 2002).

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).

Annual Harvest Data

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 CT DEEP. Those species addressed in this EA that have established hunting seasons include: American

crows, fish crows, wild turkeys, ring-necked pheasants, ruffed grouse, bobwhite quails, snow geese, Atlantic brant, wood ducks, gadwalls, American wigeons, American black ducks, mallards, blue-winged teals, Northern shovelers, Northern pintails, green-winged teals, canvasbacks, redheads, ring-necked ducks, greater scaups, lesser scaups, common eiders, surf scoters, white-winged scoters, black scoters, long-tailed ducks, buffleheads, common goldeneyes, hooded mergansers, common mergansers, red-breasted mergansers, ruddy ducks, Wilson's snipe, American woodcocks, and American coot.

For crows, take can also occur under the blackbird depredation order established by the USFWS. 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 CT DEEP in published reports.

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 those bird species addressed in this assessment is analyzed for each alternative below.

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

A common issue is whether damage management actions will adversely affect the populations of target bird species, especially when lethal methods are employed. WS maintains ongoing contact with the USFWS and the CT DEEP to ensure activities are within management objectives for those species. WS submits annual bird damage management activity reports to the USFWS. The USFWS monitors the total take of birds from all sources and factors in survival rates from predation, disease, and other mortality data. Ongoing contact with the USFWS and the CT DEEP assures local, state, and regional knowledge of wildlife population trends are considered. While local populations of birds may be reduced, compliance with applicable state and federal laws and regulations authorizing take of birds and their nest and eggs will ensure that the regional and statewide population will not be adversely affected.

Under the proposed action, WS would continue to provide both technical assistance and direct operational assistance to those persons requesting assistance with managing damage and threats associated with birds in the State. WS would employ those methods described in Appendix B in an adaptive approach that would integrate methods to effectively reduce damage and threats associated with birds in the State.

The issue of the effects on target bird species arises from the use of non-lethal and lethal methods to address the need for reducing damage and threats. As part of an integrated approach to managing damage and threats, WS could apply both lethal and non-lethal methods when requested by those persons experiencing damage.

Generally, WS only conducts damage management on species whose population densities are high and usually only after they have caused damage. WS' take is monitored by comparing numbers of animals killed with overall populations or trends in populations to assure the magnitude of take is maintained below the level that would cause undesired adverse effects 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.

Mute Swan Biology and Population Impacts

The mute swan was introduced from Europe into the United States in the late 1800's near New York City. Feral breeding took place after 544 more individuals were introduced into the lower Hudson Valley in 1910 and on Long Island in 1912. In the eastern United States, scattered breeding now occurs from New Hampshire to Virginia (Master 1992). Feral populations became established over time as swans that had escaped or been intentionally released from captivity survived and reproduced in the wild. Mute swans prefer freshwater ponds and streams of 10 acres or less and coastal bays and salt marshes. Eastern birds migrate short distances to coastal bays for the winter. The swan's diet consists mostly of rooted aquatic vegetation. Small islands, narrow peninsulas, and clumps of aquatic vegetation are preferred nesting sites.

Most mute swans breed at age three and remain with the same mate for life. Courtship display begins in late February and each pair vigorously defends their territory from other swans and other waterfowl (CTDEEP 1999). Nesting territories vary in size from 1.6 to 4 ha (4 to 10 acres) and are used year-round or reoccupied each year. The mute swan lays the largest of all swan eggs, and a typical clutch of four to eight eggs takes 35 to 38 days to hatch. Half of all young mute swans can expect to survive through age seven. Mute swans are long-lived and may reach 20 to 30 years of age (CTDEEP 1999).

In 1999, approximately 150 pairs of mute swans had been recorded nesting along the Connecticut coast and up to 20 miles inland along the major rivers, and in some inland lakes and ponds (CTDEEP 1999). The 2002 and 2008 Mid-Summer Mute Swan Surveys (MSMSS) indicated a minimum estimated populations of 1,338 and 1,012 swans respectively in Connecticut (Atlantic Flyway Council 2003, Atlantic Flyway Council 2009). Of the swans surveyed in 2008, 225 were cygnets from 71 individual broods, averaging 3.17 cygnets per brood.

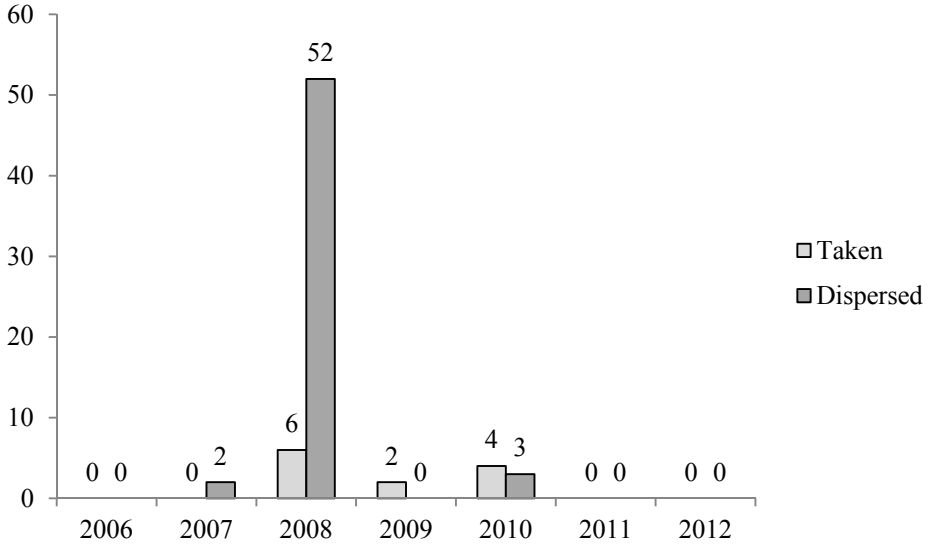
BBS population trend data show increasing populations of mute swans in the Eastern BBS Region, New England/Mid-Atlantic Region or Connecticut at rates of 4.0%, 2.8%, and 5.5% respectively (Sauer et al. 2012). CBC data from 1966 to 2011 shows an increasing trend for the number of mute swans observed wintering in Connecticut, while the number observed per party hour has remained stable (NAS 2010). From 2006 to 2011, CBC data indicate increasing trends in both the number and number per party hour of mute swans observed in Connecticut. The mute swan is ranked as a species of least concern by the International Union for Conservation of Nature and Natural Resources (IUCN 2011).

From FY 2006 through FY 2012, a total of 12 mute swans have been lethally taken by WS to alleviate damage and 57 were non-lethally dispersed (see Figure 4.1). Mute swans are not protected federally under the MBTA because they are considered an invasive exotic species. They are, however, specifically protected from hunting under Connecticut law under Title 26; Chapter 490, Section 26-94 hunting swan prohibited. Because hunting swans is illegal under state law in Connecticut, CT DEEP is aware of any mute swans taken annually by non-WS' entities. WS will contact CTDEEP and obtain appropriate prior authorization before conducting any lethal control. Based on the number of requests received to alleviate the threat of damage associated with mute swans and the number of mute swans addressed previously to alleviate those threats, WS anticipates that up to 100 mute swans could be lethally taken and all eggs in up to 50 nests could be oiled, addled, punctured or destroyed annually to alleviate damage, threats of damage and threats to human health and safety.

WS' take of up to 100 mute swans would represent 9.9% of the minimum population estimated during the 2008 MSMSS. Because mute swans are considered an invasive, exotic species and a

target population of 200 mute swans has been set under the Atlantic Flyway Mute Swan Management Plan, any lethal take by WS' could be furthering the Atlantic Flyway management goal. This goal is to reduce the mute swan population in the Atlantic Flyway to level that will minimize negative ecological impacts to wetland habitats and native migratory birds and to prevent further range expansion into unoccupied areas (Atlantic Flyway Council 2003). Additionally, WS' is required to provide for the control of invasive species, and to minimize the economic, ecological, and human health impacts that invasive species cause by Presidential Order.

Figure 4.1 – Number of mute swans addressed by WS in Connecticut 2006 to 2012



American Black Duck Biology and Population Impacts

The American black duck is closely related to the mallard, and is among the largest of North American ducks and regularly hybridize with mallards. The American black duck can be found in just about any aquatic habitat type within its range as long as there is adequate cover present. It is normally a very wary bird and is a popular game species. Susceptibility to over-hunting and other pressures has resulted in a continual population decline over the past century (Audubon 2012).

The American black duck breeds from the upper Mississippi River to the northeastern United States, north from northern Saskatchewan to the eastern Canadian provinces. The highest breeding densities are found from northern New England to the Canadian Maritimes. American black ducks utilize a variety of habitats for breeding, such as alkaline marshes, bogs, lakes, streams, fresh, brackish and salt marshes, and estuaries. Female American black ducks produce an average of nine eggs (Ducks Unlimited 2012). American black ducks are most common in the Atlantic and Mississippi flyways, mostly along the Atlantic coast from the Maritime Provinces to Florida. Highest concentrations are found wintering between Long Island, New York and North Carolina (Ducks Unlimited 2012).

From 1966 to 2011the number of American black ducks observed in the Eastern BBS Region, New England/Mid-Atlantic Region, and Connecticut, has decreased at an estimated annual rate of -0.5%, -5.9%, and -10.9%, respectively (Sauer et al. 2012). The number observed and the

number observed per party hour of American black ducks in the State during the CBC have shown decreasing trends from 1966 to 2011 (NAS 2010). The American black duck is ranked as a species of least concern by the IUCN (2011).

The number of American black ducks observed in the State during the Midwinter Waterfowl Survey conducted in 2012 was estimated at 2,100 American black ducks down from 3,500 in 2011. The five year average for American black ducks in Connecticut is 2,700. All estimates are rounded to the nearest 100 (CT DEEP 2012b).

Like other waterfowl species, American black ducks can be harvested during a regulated season in the State. An estimated 1,486 American black ducks were harvested in the State during the 2010 season and 653 American black ducks were harvested in the State during 2011 season (Raftovich et al. 2012). In addition, Raftovich et al. (2012) estimated that 91 American black duck-mallard hybrids were harvested in the State during the 2010 season and 178 hybrids were harvested in the 2011 season. Since 2006, an estimated 17,114 American black ducks and 1,877 American black duck-mallard hybrids have been harvested in the State during the regulated season (see Table 4.1) which is an average of 2,445 American black ducks and 268 American black duck-mallard hybrids harvested annually from the 2006 through 2011 seasons.

In addition to the take of American black ducks during the hunting season, a total of 87 American black ducks have been lethally taken by WS from FY 2006 through FY 2012 (Table 4.2). No American black ducks have been lethally taken under depredation permits by non-WS' entities between 2006 and 2012. From 2006 through 2012, the take of American black ducks by WS represented 0.5% of the total number of American black ducks and American black duck-mallard hybrids harvested in Connecticut during the regulated hunting season from 2006 through 2011.

Table 4.1 – Number of American black ducks and American black duck-mallard hybrids harvested 2006 to 2012

	Hunter Harvest	
Year[1]	**American black duck**	**American Black Duck-Mallard Hybrid**
2006	3,615	301
2007	2,970	424
2008	3,390	473
2009	3,298	268
2010	1,702	142
2011	1,486	91
2012	653	178
TOTAL	**17,114**	**1,877**

[1]Data reported by federal fiscal year and correlates to the prior year's hunting season, for example, the 2006 hunting season began in the fall of 2005 and ended in the winter of 2006.

Based on the number of requests received for assistance previously and in anticipation of an increase in the number of requests for assistance that will be received annually, an annual take of up to 87 American black ducks could occur under the proposed action. WS anticipates the number of airports requesting assistance with managing threats associated with American black ducks on or near airport property will increase. Since 2006, the average number of American black ducks harvested in the State has been estimated at 2,713American black ducks and American black duck-mallard hybrids. Based on the average take of American black ducks from 2006 through 2012 during the hunting season, the take of up to 75 American black ducks by WS would have represented 4.0% of the estimated annual take of American black ducks.

Table 4.2 – Number of American black ducks addressed by WS in Connecticut from 2006 to 2012

Year[1]	Dispersed by WS	WS' Take
2006	0	0
2007	0	0
2008	4,359	38
2009	924	13
2010	1,077	22
2011	122	2
2012	92	12
TOTAL	**6,574**	**87**

[1] Data reported by federal fiscal year

Based on the known take of American black ducks, the take of up to 75 American black ducks annually by WS to alleviate damage would not adversely affect American black duck populations in Connecticut. All take by WS would occur under a depredation permit issued by the USFWS and the CT DEEP for the take of those American black ducks which ensures the cumulative take of American black ducks from all known sources is considered when establishing population objectives.

Mallard Biology and Population Impacts

Mallard ducks were considered rare visitors to Connecticut in the middle 1800's and were not known to nest in the state. During the early 1900's, the deliberate release of captive mallards assisted in establishing it as a nesting species in the state. During this period there was also a natural range expansion from the Midwest into the eastern United States and Canada. By the 1930s, the mallard was breeding in local areas where birds were released. The population steadily increased. By the1970s, the mallard was the most abundant and widely distributed nesting waterfowl species in Connecticut (CT DEEP 1999). In Connecticut, mallards can be found year-round throughout the State (T. Cozine Pers. Observation).

From 1966 to 2011 (Sauer et al. 2012), the number of mallards observed in the Eastern BBS Region has decreased at an annual rate of -1.0%. During the same period, in the New England/ Mid-Atlantic Region and in Connecticut the number of mallards observed during the BBS has increased annually at an estimated 1.9% and 1.3% respectively (Sauer et al. 2012). The number of mallards observed in the State during the CBC has shown an increasing trend from 1966 to 2011 while the number per party hour has shown a general decrease during this period (NAS 2010). The mallard is ranked as a species of least concern by IUCN (2011).

The number of mallards observed in the State during the Midwinter Waterfowl Survey conducted in 2012 was estimated at 2,000 mallards down from 2,600 in 2011. The five year average for mallards in Connecticut is 1,800. All estimates are rounded to the nearest 100 (CT DEEP 2012b). Like other waterfowl species, mallards can be harvested during a regulated season in the State. An estimated 5,236 mallards were harvested in the State during 2010 and 3,890 mallards were harvested in the State during 2011 (Raftovich et al. 2012). In addition, Raftovich et al. (2012) estimated that 46 domestic mallards were harvested in the State during the 2010 season and 30 domestic mallards were harvested during the 2011 season. Since 2006, an estimated 68,188 mallards and 403 domestic mallards have been harvested during the regulated season (see Table 4.3) which is an average of 9,741 mallards and 58 domestic mallards harvested annually from the 2006 through 2011 seasons.

Table 4.3 – Number of mallards and domestic mallards harvested 2006 to 2012

Year[1]	Hunter Harvest	
	Mallard	Domestic Mallard
2006	13,857	50
2007	10,056	85
2008	15,686	39
2009	13,153	153
2010	6,310	0
2011	5,236	46
2012	3,890	30
TOTAL	**68,188**	**403**

[1]Data reported by federal fiscal year and correlates to the prior year's hunting season, for example, the 2006 hunting season began in the fall of 2005 and ended in the winter of 2006.

In addition to the take of mallards during the hunting season, a total of 200 mallards have been lethally taken by WS from FY 2006 through FY 2012. A total of 32 mallards have been lethally taken under depredation permits by all non-WS' entities to alleviate damage in Connecticut between 2006 and 2012 (Table 4.4). From 2006 through 2012, the combined take of mallards by WS and non-WS' entities under depredation permits represented 0.3% of the total number of mallards and domestic mallards harvested in Connecticut during the regulated hunting season from 2006 through 2012.

Table 4.4 – Number of mallards addressed in from FY 2006 to FY 2012

Year	Dispersed by WS[1]	Take under Depredation Permits		
		WS' Take[1]	Non-WS' Take[2]	Total Take by All Entities
2006	0	0	1	1
2007	0	0	0	0
2008	911	59	6	65
2009	139	17	3	20
2010	1,303	69	7	76
2011	57	32	0	32
2012	443	23	15	38
TOTAL	**2,853**	**200**	**32**	**232**

[1]Data reported by federal fiscal year

[2]Data reported by calendar year

Based on the number of requests received for assistance previously and in anticipation of an increase in the number of requests for assistance that will be received annually, an annual take of up to 150 mallards could occur under the proposed action. WS anticipates the number of airports requesting assistance with managing threats associated with mallards on or near airport property will increase. Since 2006, the average number of mallards harvested in the State has been estimated at 9,798 mallards and domestic mallards. Based on the average take of mallards from 2006 through 2012 during the hunting season, the take of up to 150 mallards by WS would have represented 1.5% of the estimated take of mallards.

Based on the known take of mallards, the take of up to 150 mallards annually by WS to alleviate damage would not adversely affect mallard populations in Connecticut. All take by WS would occur under a depredation permit issued by the USFWS and the CT DEEP for the take of those mallards which ensures the cumulative take of mallards from all known sources is considered when establishing population objectives.

Eastern Wild Turkey Biology and Population Impacts

Wild turkeys found in Connecticut 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). There are six distinct subspecies of wild turkeys in North America, with the Eastern wild turkey subpopulation being the most abundant and most widely distributed. In the Eastern United States, wild turkeys inhabit hardwood, mixed, and pine forests foraging on a variety of acorns, fruit, seeds, and insects. Turkeys are considered permanent residence 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).

Once extirpated from the State from over-hunting and habitat loss, the Eastern wild turkey now can be found statewide in suitable habitat. Between 1975 and 1992, 356 turkeys were released at 18 sites throughout the state. These releases and subsequent population expansion have resulted in the successful restoration of wild turkeys to all 169 Connecticut towns (CT DEEP 2008). The number of turkeys observed in areas surveyed during the BBS has shown an increasing trend in Connecticut estimated at 17.6% from 1966 through 2011 with a 6.9% annual increase from 2001 through 2011 (Sauer et al. 2012). After reintroduction in 1975, the total number of turkeys observed and and the number observed per party hour in the State during the CBC have shown an increasing trend since 1966 (NAS 2010). The statewide turkey population is estimated between 35,000 to 38,000 birds. Healthy and numerous wild turkey populations exist throughout the majority of Connecticut's woodlands (CT DEEP 2012c). The Eastern wild turkey is ranked as a species of least concern by IUCN (2011).

Populations of turkeys are sufficient to allow for annual hunting seasons. The numbers of turkeys harvested in the State from 2006 through 2011 during the annual turkey hunting seasons are shown in Table 4.5. Bearded turkeys, typically males, can be harvested in the State during the concurrent annual spring firearm and archery hunting seasons, 2 on public lands, 3 on private lands, and 3 by landowners. Either sex birds can be taken during the annual fall firearm and archery hunting seasons. The highest number of turkeys harvested during the hunting seasons from 2006 to 2011 occurred in 2006 when 2,218 turkeys were harvested in the State. There has been a steady decrease in annual turkey harvest in Connecticut since 2006. In 2010, a total of 1,351 turkeys were harvested, a decrease of almost 39.1% from the 2006 harvest.

Requests for assistance received by the WS program in Connecticut to manage damage or threats of damage associated with wild turkeys occur primarily at airports where turkeys can pose strike risks to aircraft. Turkeys are also known to attack people and cause damage to windows, siding, and vehicles when turkeys, primarily males during the breeding season, see humans as rivals or mistake their reflection as another turkey and attempt to attack the image which can scratch paint on vehicles and siding on houses. Between FY 2006 through FY 2012, WS has dispersed a total of 36 turkeys to manage damage or threats of damage occurring within the State when requested. In addition, WS has also employed lethal methods to take a total of 34 wild turkeys between FY 2006 and FY 2012. All turkeys lethally taken were at airports where those turkeys posed an immediate threat of aircraft strikes by feeding or loafing on or moving across active runways and/or taxiways.

Table 4.5 – Number of Eastern wild turkeys addressed and turkey harvest from 2006-2011 in Connecticut

Year	Dispersed by WS[1]	Depredation take and Harvest				Total
		WS' Take[1]	Fall Archery Harvest[2]	Fall Firearm Harvest[2]	Spring Harvest[2]	
2006	0	0	156	46	2,016	**2,218**
2007	0	0	109	26	1,601	**1,736**
2008	27	26	165	43	1,558	**1,792**
2009	9	0	211	51	1,502	**1,764**
2010	0	1	64	41	1,245	**1,351**
2011	0	6	n/a†	n/a†	1,424	**1,430**
2012	**0**	**1**	**n/a†**	**n/a†**	**n/a†**	**1**
Total	**36**	**33**	**705**	**207**	**9,346**	**10,258**

[1]Data reported by federal fiscal year
[2]Data reported by previous years fall seasons and current years spring seasons and correlates to the federal fiscal year, for example 2006 refers to the 2005 fall firearms and archery season and the spring 2006 seasons.
†Data not available at the time this EA was prepared.

Based on previous requests for assistance and in anticipation of receiving an increasing number of requests for assistance as the turkey population increases, WS could lethally take up to 100 wild turkeys annually under the proposed action alternative. Based on the lower statewide population estimate of 35,000 turkeys, the take of up to 100 turkeys by WS would represent 0.3% of the estimated statewide population if the population remains at least stable. If WS had lethally taken 100 turkeys in FY 2011, the take would have represented 7.4% of the number of turkeys harvested in the State in 2010 which was the lowest harvest level in the State between the fall 2005 seasons and the spring 2011 season, which correlates to FY 2006 to FY 2011. The take of wild turkeys by WS will only occur at levels permitted by the CT DEEP which regulates the take of wild turkeys and further ensures that WS' take will not have any adverse effects.

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). The population (breeding and non-breeding birds) in the United States was estimated to be greater than one million birds in the 1990's (Tyson et al. 1999). The USFWS estimated the global population at approximately 2.2 million cormorants, 90% of this population in North America (USFWS 2006). The Mid-Atlantic/New England/Maritimes population was estimated at over 173,000 breeding pairs, 16,860 of these in the Southern New England area which includes Connecticut. Most of

Connecticut is included in Bird Conservation Region (BCR) 30 and the remainder, in Northwest Connecticut, is in BCR 14. BCR 30 has approximately 29,700 nesting pairs while BCR 14 has approximately 143,400 nesting pairs (USFWS 2006). 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).

The double-crested cormorant is a relatively recent breeder in Connecticut, with first nesting documented in 1979 at East White Rock in the Norwalk Islands (Wood 1979). In 1998, there were a total of 26 known colony sites; complete censuses were conducted every three years from at least 1986, when 181 pairs were recorded. Between 1986 and 1989, numbers increased by more than 600 %, and reached a peak of 1,117 pairs. By 1992, numbers had declined by close to 50%. Censuses in 1995 and 1998 indicated that numbers were again increasing; in 1998, the last survey year, a total of 961 pairs were estimated by CTDEEP (Wires et al. 2001). Breeding Bird Survey (BBS) data from 1966 to 2011 indicate that double-crested cormorant populations in the Eastern BBS Region, New England/Mid-Atlantic Region, and Connecticut have increased annually at rates of 3.6%, 12.0%, and 6.0%, respectively (Sauer et al. 2012).

Along with the increase in breeding birds, in the 1980s the species became regular in winter along the coast and inland during migration (Sibley 1994; Zeranski and Baptist 1990). However, only small numbers of birds, 25 to 100 individuals, were estimated to winter in the state by CTDEEP (Wires et al. 2001). CBC data from surveys conducted from 1966 through 2011 shows an average of 71 cormorants have been observed in areas surveyed ranging from a low of zero cormorants in 1970 and 1971 to a high of 361 cormorants in 1984 (NAS 2002). During this period, the total number of cormorants observed during CBC surveys has shown an increasing trend, while observations per party hour have shown a decline. The double-crested cormorant is ranked as a species of lowest concern by the Mid-Atlantic/New England/Maritimes Regional Waterbird Conservation Plan (USFWS 2006) and as a species of least concern by the IUCN (2011).

As shown in Table 4.1, the total annual take of cormorants from 2006 through 2012 has not exceeded three cormorants in any given year. The highest level of cormorant take occurred in 2009 when two cormorants were lethally taken which represents 0.1% of the estimated 1,922 cormorants breeding in Connecticut in 1998. From FY 2006 through FY 2012, WS has lethally taken two cormorants in the State to alleviate damage or threats (see Table 4.6). All take occurred under depredation permits issued by the USFWS. WS has also employed non-lethal methods to disperse 756 cormorants to alleviate damage or threats between FY 2006 and FY 2012.

From 2006 to 2012, take of cormorants by other entities in Connecticut through depredation permits issued by the USFWS has resulted in the take of five cormorants. More than 99.7% of the cormorants addressed by WS from FY 2006 through FY 2012 were addressed using non-lethal methods.

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).

Table 4.6 – Double-crested cormorants addressed in Connecticut from FY 2006 to FY 2012

Year	Dispersed by WS[1]	Take Under Depredation Permit		
		WS' Take[1]	Non-WS' Take[2]	Total Take by All Entities
2006	0	0	1	1
2007	79	0	0	0
2008	469	1	0	1
2009	12	0	2	2
2010	35	0	0	0
2011	0	0	0	0
2012	161	1	2	3
TOTAL	**756**	**2**	**5**	**7**

[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 Connecticut, 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. If an increase in the number of requests for assistance occurs, under the proposed action, the number of cormorants lethally taken annually by WS will also likely increase to address threats occurring to aviation safety, natural resources and aquaculture.

Based on increasing trends in the number of cormorants observed during the development of this EA, WS anticipates that up to 100 cormorants total could be lethally taken by WS and up to 50 cormorant nests with eggs could be removed and destroyed annually to alleviate damage under depredation permits.

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-around in most of the United States, including Connecticut (Butler 1992). Great blue herons are most often located in freshwater and brackish marshes, lakes, rivers, and lagoons (USFSW 2006). Herons are known to nest in trees, rock ledges, and coastal cliffs and may travel up to 30 km to forage with a mean forage distance of 2.6 to 6.5 km (USFWS 2006). Great blue herons feed mainly on fish but are also known to capture invertebrates, amphibians, reptiles, birds, and mammals (Butler 1992).

Great blue herons are showing a statistically significant increase across all survey routes of the BBS. In the Eastern BBS, New England/Mid-Atlantic, and Connecticut, herons observed on BBS routes are showing statistically significant upward trends estimated respectively at 0.8%, 2.6%, and 7.5% annually from 1966 through 2011 (Sauer et al. 2012).

Herons observed overwintering in Connecticut have shown a general increasing trend since 1966 (NAS 2010). The number of counts reporting great blue herons during CBC surveys increased from two counts reporting herons in 1966 to 16 counts reporting herons during six survey years during this period. The total number of great blue herons and number of herons per party hour observed during the CBC has shown an increasing trend in Connecticut from 1966 to 2011. Total

observations have increased from 14 birds observed in 1966 in Connecticut to 441 individuals in 1999, averaging 183 herons annually (NAS 2010).

In 2006, the breeding population of great blue herons was estimated at 30,570 pairs in BCR 30 which comprises most of Connecticut, and at 11,662 pairs in BCR 14 which comprises the remainder of Connecticut (USFWS 2006). The current population of great blue herons is unknown in Connecticut. The Mid-Atlantic/New England/Maritimes Regional Waterbird Conservation Plan and the IUCN rank the great blue heron as a species of lowest/least concern (USFWS 2006).

To alleviate threats to aviation safety, WS has lethally taken 22 great blue herons in Connecticut, averaging 3.1 per year, from FY 2006 through FY 2012. WS has also employed non-lethal methods to disperse 39 herons from FY 2006 to FY 2012. In addition to the take of herons by WS to alleviate damage or threats, the USFWS has issued depredation permits co-signed by CTDEEP to other entities for the take of herons. As shown in Table 4.7, 80 herons were lethally taken by non-WS' entities to alleviate damage or threats associated with great blue herons from 2006 through 2012, averaging 11.4 herons per year. The highest level of take occurred in 2008 when 21 herons were lethally taken. On average, 14.6 herons have been lethally taken under depredation permits to alleviate damage or threats from 2006 through 2012.

To address requests for assistance to manage damage associated with great blue herons in the future, up to 30 herons could be lethally taken annually by WS to alleviate damage and threats. The increased level of take analyzed when compared to the take occurring by WS from FY 2006 through FY 2012 is in anticipation of requests to address threats of aircraft strikes at airports and to reduce damage to natural resources, such as nest site competition between herons and other colonial nesting waterbirds, and predation at fish hatcheries and aquaculture facilities. If the average annual take of nearly 12 herons by other entities is reflective of take that will occur in the future, the combined WS' take and take by other entities would total 42 herons. When included with the highest heron take that occurred by all entities of 21 herons in 2008, the take of up to 30 herons by WS annually would total 51 herons lethally taken.

Table 4.7 – Number of great blue herons addressed in Connecticut from FY 2006 to FY 2012

Year	Dispersed by WS[1]	Take under Depredation Permits		
		WS' Take[1]	Non-WS' Take[2]	Total Take by All Entities[2]
2006	0	0	16	16
2007	0	0	5	5
2008	7	7	14	21
2009	11	6	13	19
2010	14	1	14	15
2011	2	8	0	8
2012	5	0	18	18
TOTAL	**39**	**22**	**80**	**102**

[1]Data reported by federal fiscal year

[2]Data reported by calendar year

The number of great blue herons present in Connecticut at any given time likely fluctuates throughout the year. No breeding or wintering population estimates are available for great blue herons in Connecticut. Given the increasing population trends observed for herons in Connecticut, the limited take proposed by WS when compared to the estimated breeding populations in BCR's 14 and 30, the magnitude of WS' estimated take could be considered low.

The permitting of the take by the USFWS and CT DEEP ensures the cumulative take of herons in New England and the Mid-Atlantic, including the take proposed by WS under this assessment, will not reach a magnitude where undesired adverse effects occur. The take of herons by WS will occur within allowed levels of take permitted by the USFWS and CT DEEP.

Black-crowned Night-heron Biology and Population Impacts

With a range that spans five continents, including much of North America, the Black-crowned night-heron is the most widespread heron in the world. They are the most widespread species of heron in the world, ranging across North and South America, Asia, Europe, and Africa (Davis 1993).

A wide variety of wetland habitats are used including marshes, swamps, ponds, lakes, grassy salt marsh. Species nests in trees in wooded areas near water or on the ground on islands and forages in shallow, weedy pond margins, creeks, marshes, mudflats, tidal creeks, ditches, and around pilings (USFWS 2006). Black-crowned night-herons feed mainly on small fish, crustaceans, frogs, aquatic insects, small mammals and small birds.

From 1966 to 2011, black-crowned night-herons in the Eastern BBS Region and New England/ Mid-Atlantic Region are showing a decrease estimated at -1.2% and -1.3%, respectively. Black-crowned night-herons in Connecticut are showing an increase estimated at 6.3% annually over the same period (Sauer et al. 2012). The total number of black-crowned night-herons observed and the number observed per party hour overwintering in Connecticut have shown decreasing trends from1966 to 2011 (NAS 2010). Total observations have averaged 24.3 night-herons annually (NAS 2010).

In 2006, the breeding population of black-crowned night-herons was estimated at 10,388 pairs in BCR 30 which comprises most of Connecticut, and at 2,468 pairs in BCR 14 which comprises the remainder of Connecticut (USFWS 2006). The current population of black-crowned night-herons is unknown in Connecticut. The Mid-Atlantic/New England/Maritimes Regional Waterbird Conservation Plan ranks the black-crowned nigh-heron as a species of moderate concern (USFWS 2006) and the IUCN (2011) ranks the black-crowned night-heron as a species of least concern.

To alleviate predation and threats to T&E species and threats to aviation safety, WS has lethally taken 21 black-crowned night-herons, averaging three per year, from FY 2006 through FY 2012. WS has also employed non-lethal methods to disperse 24 night-herons from FY 2006 to FY 2012. In addition to the take of night-herons by WS to alleviate damage or threats, the USFWS has issued depredation permits co-signed by CTDEEP to other entities for the take of night-herons. No night-herons were lethally taken by non-WS' entities from 2006 through 2012.

To address requests for assistance to manage damage and threats associated with black-crowned night-herons in the future, up to 30 black-crowned night-herons could be lethally taken annually by WS to alleviate damage and threats. The increased level of take analyzed when compared to the take occurring by WS from FY 2006 through FY 2012 is in anticipation of requests to address threats to T&E species, threats of aircraft strikes at airport, and predation at fish hatcheries and aquaculture facilities.

The number of black-crowned night-herons present in Connecticut at any given time likely fluctuates throughout the year. No breeding or wintering population estimates are available for black-crowned night-herons in Connecticut. Given the increasing population trends observed for

herons in Connecticut, the limited take proposed by WS when compared to the estimated breeding populations in BCR's 14 and 30, the magnitude of WS' estimated take could be considered low. The permitting of the take by the USFWS and CT DEEP ensures the cumulative take of herons in New England and the Mid-Atlantic, including the take proposed by WS under this assessment, will not reach a magnitude where undesired adverse effects occur. The take of herons by WS will occur within allowed levels of take permitted by the USFWS and CT DEEP.

Black Vulture Population Impact Analysis

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). Black vultures are considered locally resident (Rabenhold and Decker 1989); however, some populations will migrate (Eisenmann 1963 cited from Wilbur 1983). Black vultures nest and roost primarily in mature forested areas. Black vultures typically feed by scavenging but occasionally take live prey, especially newborn livestock (Brauning 1992). Black vultures have been reported to live up to 25 years of age (Henny 1990).

Black vultures are relative newcomers to Connecticut were first confirmed nesting in the town of Kent in 2002 (Connecticut Ornithological Association 2002). No BBS trend data is currently available for black vultures in Connecticut. However, BBS trend data for black vultures observed in the Eastern BBS Region and the New England/Mid-Atlantic Region have increased at annual rates of 3.4% and 8.2% respectively from 1966 through 2011 (Sauer et al. 2012). The Partners in Flight Landbird Population Estimates Database does not provide a population estimate for black vultures in Connecticut (Rich et al. 2004). The total number of black vultures and the number per party hour observed overwintering in Connecticut has shown a steady increasing trend from 1989, the first year the species was reported in CBC surveys in Connecticut, to 2011 (NAS 2010). CBC observations of black vultures during this period have ranged from a low of zero in several years in the early 1990's to a high of 227 in 2010, averaging 44 observations annually. The IUCN (2011) ranks the black vulture as a species of least concern.

Partners in Flight population estimates are derived from BBS data for individual species (Rich et al. 2004). BBS survey data is derived from surveyors identifying bird species based on visual and auditory cues within a quarter mile of stationary points along established survey routes. Black 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 or feeding. 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. Most vultures during surveys are counted while flying since counting at roosts can be difficult due to obstructions limiting sight and due to the constraints of boundaries used during the surveys, especially the BBS survey since observers are limited to counting only those bird species within a quarter mile of a survey point. Bunn et al. (1995) reported vulture activity increased from morning to afternoon as temperatures increased. 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 the likely cause of the lack of a population estimate for black vultures by Rich et al. (2004).

In FY 2009 WS live captured one black vulture chick and turned it over to a licensed wildlife rehabilitator and in FY 2010 non-lethally dispersed two black vultures in the Connecticut to alleviate threats to aviation safety at an airport. No non-WS take of black vultures has been reported to the USFWS under depredation permits.

Based on the anticipated increasing need to address damage associated with black vultures and the significant population increase, up to 50 black vultures could be lethally taken under the proposed action to address damage and threats associated with black vultures.

Similar to the other native migratory bird species addressed in this assessment, the take of black vultures can only occur when authorized through the issuance of depredation permits by the USFWS which are co-signed by the CT DEEP. The permitting of the take ensures the cumulative take of black vultures annually occurs within allowable take levels to achieve desired population objectives for the species. Therefore, the take of vultures by WS will only occur at levels permitted by the USFWS and the CT DEEP through the issuance of depredation permits.

Turkey Vulture Population Impact Analysis

Turkey vultures can be found throughout Mexico, across most of the United States, along the southern tier of Canada (Wilbur 1983, Rabenhold and Decker 1989) and throughout the year in Connecticut (Kirk and Mossman 1998, T. Cozine Pers. Observation). Turkey vultures can be found in virtually all habitats but are most abundant where forested areas are interrupted by open land (Brauning 1992). Turkey vultures nest on the ground in thickets, stumps, hollow logs, or abandoned buildings (Walsh et al. 1999). They often roost in large groups near homes or other buildings where they can cause property damage from droppings or by pulling and tearing shingles or rubber roofing material. 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).

BBS trend data for turkey vultures observed in the Eastern BBS Region, the New England/Mid-Atlantic Region and Connecticut have increased at annual rates of 3.5%, 3.8% and 6.3% respectively from 1966 through 2011 (Sauer et al. 2012). The statewide population of turkey vultures is currently unknown but has been estimated at 400 turkey vultures based on BBS data (Rich et al. 2004). However, the population is probably much higher than this as BBS surveys are not well designed for monitoring vulture populations as discussed in the previous section on black vultures. The total number of turkey vultures observed and the number observed per party hour overwintering in Connecticut has shown a steady increasing trend from 1967, the first year the species was reported in CBC surveys in Connecticut, to 2011 (NAS 2010). CBC observations of turkey vultures have ranged from a low of zero in the late 1960's and early 1970's to a high of 742 in 2006, averaging 173 observations annually. The IUCN (2011) ranks the turkey vulture as a species of least concern.

The take of turkey vultures is also prohibited under the MBTA except through the issuance of depredation permits issued by the USFWS. The number of turkey vultures addressed in Connecticut by all entities to alleviate damage is shown in Table 4.8. From FY 2006 through FY 2012, the WS program has lethally taken seven turkey vultures and employed non-lethal methods to disperse 83 vultures to alleviate damage. Two turkey vultures have been lethally taken from 2006 through 2012 by all non-WS entities pursuant to depredation permits issued by the USFWS and the CT DEEP. From FY 2006 through FY 2012, an average of 1.3 turkey vultures has been lethally taken by all entities to alleviate damage pursuant to depredation permits.

Table 4.8 – Number of turkey vultures addressed in Connecticut from FY 2006 to FY 2012

Year	Dispersed by WS[1]	Take under Depredation Permits		
		WS' Take[1]	Non-WS' Take[2]	Total Take by All Entities[2]
2006	0	0	0	0
2007	0	0	0	0
2008	4	0	1	1
2009	10	3	0	3
2010	39	2	1	3
2011	2	1	0	1
2012	28	1	0	1
TOTAL	**83**	**7**	**2**	**9**

[1]Data reported by federal fiscal year

[2]Data reported by calendar year

As the population of turkey vultures has increased, the number of requests for assistance to alleviate damage associated with turkey vultures has also increased. Based on current population trends for turkey vultures, the number of requests for assistance with managing damage associated with turkey vultures and the number of vultures that will be addressed to meet those requests is also likely to increase. 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 50 turkey vultures could be lethally taken annually by WS to alleviate damage and threats.

If up to 50 turkey vultures were taken annually, WS' take would represent 12.5% of the estimated statewide population of turkey vultures estimated at 400 vultures if the population remains at least stable. If the take by other entities remains stable, the cumulative take of vultures annually by all entities would be nearly 52 vultures. The cumulative take of vultures would represent 13.0% of the statewide population if the population remains stable. The permitting of the take by the USFWS and the CT DEEP 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.

Osprey Biology and Population Impacts

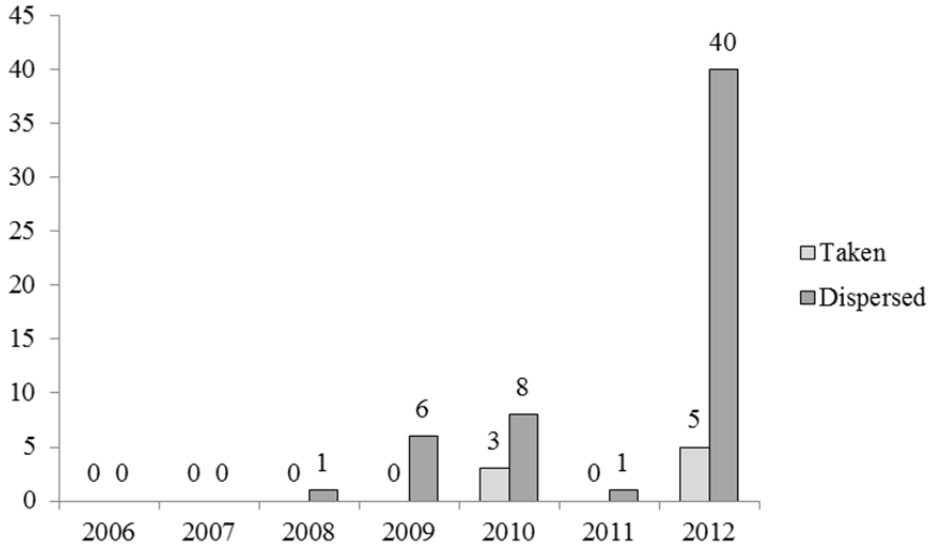
Ospreys are large raptors most often associated with shallow aquatic habitats where they feed primarily on fish (Poole et al. 2002). Historically, nests of osprey were constructed on tall trees and rocky cliffs. Today, ospreys are most commonly found nesting on man-made structures such of power poles, cell towers, and man-made nesting platforms (Poole et al. 2002). Osprey can be located throughout the year along the coastal areas of the State with breeding populations also occurring further inland (Poole et al. 2002).

Requests for assistance received by WS to alleviate damage or the threat of damage associated with osprey involved threats to aircraft from strikes and were associated with nesting behavior. Osprey nests are often constructed of large sticks, twigs, and other building 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. For example, the average osprey nest size in Corvallis, Oregon weighed 264 pounds and was 41-inches in diameter (USGS 2005). In 2001,

74% of occupied osprey nests along the Willamette River in Oregon occurred on power pole sites (USGS 2005).

WS has responded to requests for assistance involving osprey previously by providing technical assistance and by providing direct operational assistance through the use of nest and egg removal and destruction, harassment methods to disperse osprey, and lethal removal with firearms. Between FY 2006 and FY 2012, the WS program in Connecticut addressed two osprey nests, one with eggs to manage damage and threats related to electrical utility and radio transmission structures. As shown in Figure 4.2, WS addressed 56 ospreys using non-lethal harassment methods, and lethally removed eight ospreys to alleviate threats to aviation safety during this period. No osprey or active osprey nests were lethally taken or destroyed by non-WS entities under depredation permits from 2006 to 2012.

Figure 4.2 – Number of ospreys addressed by WS in Connecticut 2006 to 2012



Under the proposed action alternative, WS could be requested to use lethal methods to remove osprey when non-lethal methods are ineffective or are determined to be inappropriate using WS Decision model. An example could include osprey that pose an immediate strike threat at an airport where attempts to disperse the osprey are ineffective. WS will continue to employ primarily non-lethal methods to address requests for assistance with managing damage or threats of damage associated with osprey in the State. Based on previous requests for assistance to manage damage associated with osprey and in anticipation of receiving an increasing number of requests for assistance, WS could lethally take up to 10 ospreys annually to alleviate damage.

Since 1966, the number of osprey observed along routes surveyed in the EBBS Regions, New England/Mid-Atlantic Region and Connecticut during the BBS has shown increasing trends estimated at 3.4%, 6.9%, and 12.2% annually (Sauer et al. 2012). The number of osprey observed in areas surveyed during the CBC has also shown a slight decreasing trend in the State from 1973, the first year osprey are reported in the CBC surveys, to 2011 (NAS 2010). However, the number of ospreys observed per party hour has shown an increasing trend in Connecticut during the same period (NAS 2010). Based on BBS data, Rich et al. (2004) estimated the statewide population of osprey was 200 birds. The IUCN (2011) ranks the osprey as a species of least concern.

Based on a statewide population estimated at 200 osprey and if up to 10 osprey were taken in any given year, WS' take would represent 5.0% of the estimated population if the population remains at least stable. A population of 200 ospreys would represent approximately 100 breeding pairs, WS' removal and destruction of up to 5 osprey nests with eggs would represent 5.0% of the annual nesting activity, if the breeding pairs do not relocate and nest in another location. The take of osprey and active osprey nests by WS would only occur when permitted and only at levels authorized on depredation permits issued by the USFWS and the CT DEEP.

Bald Eagle Population Impact Analysis

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 (Buehler 2000). During the migration period, eagles can be found throughout the United States and parts of Mexico (Buehler 2000). The migration of eagles has been labeled as "*complex*" which can make determining migration movement difficult to ascertain. Migration is dependent on many factors, including the age of the eagle, location of the breeding site, severity of the climate at the breeding site, and availability of food (Buehler 2000). Generally, the fall migration period begins in mid-August and extends through mid-November with peak periods occurring from September through October. The spring migration period generally begins in March and extends through May with peak periods occurring from mid-March through mid-May (Buehler 2000).

Eagles are opportunistic feeders with a varied diet that consists of mammalian, avian, and reptilian prey; however, eagles are most fond of fish (Buehler 2000). Buehler (2000) describes food acquisition by eagles as "[An eagle] *often scavenges prey items when available, pirates food from other species when it can, and captures its own prey only as a last resort*". Eagles are thought to form life-long pair bonds but information on the relationship between pairs is not well documented (Buehler 2000). Nesting normally occurs from late-March through September with eggs present in nests from late-May through the end of May. Eaglets can be found in nests generally from late-May through mid-September (Buehler 2000). Nests of bald eagles occur primarily near the crown of trees with typical nests ranging in size from 1.5 to 1.8 meters in diameter and 0.7 to 1.2 meters tall (Buehler 2000).

Populations of bald eagles showed periods of steep declines in the lower United States during the early 1900s. Population declines have been attributed to the loss of nesting habitat, hunting, poisoning, and pesticide contamination. To curtail steep declining trends in bald eagles, the Bald Eagle Protection Act was passed in 1940 which prohibited the taking or possession of bald eagles or any parts of eagles. The Bald Eagle Protection Act was amended in 1962 to include the golden eagle and is now referred to as the Bald and Golden Eagle Protection Act (see Section 1.7). Certain populations of bald eagles were listed as "*endangered*" under the Endangered Species Preservation Act of 1966 which was extended when the modern ESA of 1973 was passed. The bald eagle was officially de-listed from the ESA on June 28, 2007 except for the Sonora Desert bald eagle population which remained classified as a threatened species. Although officially removed from the protection of the ESA across most of the range of the eagle, the bald eagle now is afforded protection under the Bald and Golden Eagle Protection Act in addition to the Migratory Bird Treaty Act.

As was discussed in Chapter 1, under the Bald and Golden Eagle Protection Act, the definition of "*take*" includes actions that can "*molest"* or *"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 2009*b*). 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 previously received requests for assistance associated with bald eagles posing threats at or near airports. 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 "*molest*" and "*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 of aircraft strikes at airports. Under this proposed action alternative, WS could employ harassment methods to disperse eagles from airports 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 will only be conducted by WS when a permit allowing for the harassment of eagles has been issued to WS or to an airport authority where WS is working as a subpermittee under the permit issued to the airport. No lethal take of eagles would occur under this proposed action alternative.

WS will 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 2009*b*). 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 2009*b*).

Red-shouldered Hawk Biology and Population Impacts

Red-shouldered hawks are a common forest-dwelling hawk of the East and California, and favors woodlands near water. Egg-laying in red-shouldered hawks occurs from late-March through early-May with April being the primary period when eggs are laid (Dykstra et al. 2008). Nestlings can be found from late-April through late July with the peak occurring from early-May through late-June (Dykstra et al. 2008). The number of eggs laid by red-shouldered hawks ranges from two to five eggs with averages of three to four eggs in most of the eastern portion of their range (Dykstra et al. 2008). Replacement clutches are known to occur if the first clutch is destroyed (Palmer 1988).

Requests for assistance with red-shouldered hawks received by WS are usually associated with threats to human safety or human injury associated with nesting behavior, but may also involve

threats to aircraft from strikes. Some requests for assistance may also involve real or perceived threats to household pets or livestock such as poultry posed by red-shouldered hawks that may involve nest aggression or predation.

WS has responded to requests for assistance involving red-shouldered hawks previously by providing technical assistance and by providing direct operational assistance through the use of nest removal and destruction, and harassment methods to disperse red-shouldered hawk, and live capture and transport to licensed raptor rehabilitators. Between FY 2006 and FY 2012, the WS program in Connecticut addressed one red-shouldered hawk nest with four chicks, one red-shouldered hawk fledgling, and one adult red-shouldered hawk to manage damage and threats related to threat to human safety and human injury due to attack. Also during this period, WS addressed two red-shouldered hawks using non-lethal harassment methods to alleviate threats to aviation safety. No red-shouldered hawk or active red-shouldered hawk nests with eggs were lethally taken or destroyed by WS or non-WS entities under depredation permits from 2006 to 2011.

Under the proposed action alternative, WS could be requested to use lethal methods to remove red-shouldered hawk when non-lethal harassment methods are ineffective or are determined to be inappropriate for eliminating threats to human health and safety, damage or threats of damage using WS Decision model. Examples could include taking one of a pair of red-shouldered hawks where nest and egg destruction was previously used but did not result in the desired outcome of the hawks relocating to a safe nesting site or removal of a red-shouldered hawk that poses an immediate strike threat at an airport where attempts to disperse the red-shouldered hawk are ineffective. WS could also live capture dangerous or threatening red-shouldered hawks or juvenile hawks and transport them to licensed raptor rehabilitators, falconers, or zoos for temporary or permanent captivity.

WS will continue to employ primarily non-lethal methods to address requests for assistance with managing damage or threats of damage associated with red-shouldered hawk in the State. Based on previous requests for assistance to manage damage associated with red-shouldered hawk and in anticipation of receiving an increasing number of requests for assistance, WS could lethally take up to 10 red-shouldered hawks and destroy up to five red-shouldered hawk nests with eggs annually to alleviate damage.

Since 1966, the number of red-shouldered hawk observed along routes surveyed in the EBBS Regions, New England/Mid-Atlantic Region, and Connecticut during the BBS has shown increasing trends estimated at 2.6%, 2.7%, and 7.1% annually (Sauer et al. 2012). The number red-shouldered hawks and the number observed per party hour in areas surveyed during the CBC have shown an increasing trend in the State from 1966 to 2011 (NAS 2010). Based on BBS data, Rich et al. (2004) estimated the statewide population of red-shouldered hawk was 600 birds. The IUCN (2011) ranks the red-shouldered hawk as a species of least concern.

Based on a statewide population estimated at 600 red-shouldered hawk and if up to 10 red-shouldered hawk were taken in any given year, WS' take would represent 1.7% of the estimated population if the population remains at least stable. A population of 600 red-shouldered hawks would represent approximately 300 breeding pairs, WS' removal and destruction of up to five red-shouldered hawk nests with eggs would represent 1.7% of the annual nesting activity, if the breeding pairs do not relocate and nest in another location. Placement into permanent captivity would only be done with the express authorization of CT DEEP. Placement would be with properly licensed wildlife rehabilitators, falconers, or zoos. The take of red-shouldered hawks

and active red-shouldered hawk nests by WS would only occur when permitted and only at levels authorized on depredation permits issued by the USFWS and the CT DEEP.

Broad-winged Hawk Biology and Population Impacts

The broad-winged hawk completely leaves its breeding grounds in the fall and winter. Huge numbers of migrating broad-wings can be seen at hawk watches across the East. It usually migrates in large flocks or "kettles" that can range from a couple of individuals to thousands (Haines et al. 2003).

The nest is a large bowl of sticks, lined with bark chips and is often decorated with green twigs. It may be placed upon old crow or squirrel nest. Egg-laying in broad-winged hawks occurs from late-April through early-June with peak egg laying occurring from early-May through late-May (Goodrich et al. 1996). Nestlings can be found from late-May through mid-August with the peak occurring from June through July (Goodrich et al. 1996). The number of eggs laid by red-shouldered hawks range from one to five eggs with averages of two to three eggs most common (Goodrich et al. 1996).

Requests for assistance with broad-winged hawks received by WS are usually associated with threats to human safety or human injury associated with nesting behavior, but may also involve threats to aircraft from strikes. Some requests for assistance may also involve real or perceived threats to household pets or livestock such as poultry posed by broad-winged hawks that may involve nest aggression or predation.

WS has responded to requests for assistance involving broad-winged hawk previously by providing technical assistance and by providing direct operational assistance through the use of nest and egg removal and destruction, and lethal methods. Between FY 2006 and FY 2012, the WS program in Connecticut addressed one broad-winged hawk nest with four eggs and one broad-winged hawk was lethally removed by air rifle to manage threats to human safety and human injury due to attack. No broad-winged hawks or active broad-winged hawk nests with eggs were lethally taken or destroyed by non-WS entities under depredation permits from 2006 to 2012.

Under the proposed action alternative, WS could be requested to use lethal methods to remove broad-winged hawks when non-lethal harassment methods are ineffective or are determined to be inappropriate for eliminating threats to human health and safety, damage or threats of damage using WS Decision model. Examples could include taking one of a pair of broad-winged hawks where nest and egg destruction was previously used but did not result in the desired outcome of the hawks relocating to a safe nesting site or removal of a broad-wined hawk that poses an immediate strike threat at an airport where attempts to disperse the broad-winged hawk are ineffective. WS could also live capture dangerous or threatening broad-winged hawks or juvenile hawks and transport them to licensed raptor rehabilitators, falconers, or zoos for temporary or permanent captivity.

WS will continue to employ primarily non-lethal methods to address requests for assistance with managing damage or threats of damage associated with broad-winged hawk. Based on previous requests for assistance to manage damage associated with broad-winged hawk and in anticipation of receiving an increasing number of requests for assistance, WS could lethally take up to 10 broad-winged hawks and remove and destroy up to five nests with eggs annually to alleviate threats and damage.

Since 1966, the number of broad-winged hawk observed along routes surveyed in the EBBS Region and Connecticut during the BBS have shown increasing trends estimated at 1.0% and 1.2% annually (Sauer et al. 2012). During this period, the New England/Mid-Atlantic Region has seen a decrease estimated at -0.5% annually (Sauer et al. 2012). Broad-winged hawks are highly migratory and only five observations of individual broad-winged hawks have been recorded in Connecticut from 1966 to 2011 in areas surveyed during the CBC. The number of broad-winged hawks observed per party hour has shown an increasing trend in Connecticut during this period, however the number of observations is very low (NAS 2010). Based on BBS data, Rich et al. (2004) estimated the statewide population of broad-winged hawk was 5,000 birds. The IUCN (2011) ranks the broad-winged hawk as a species of least concern (USFWS 2006).

Based on a statewide population estimated at 5,000 broad-winged hawk and if up to 10 broad-winged hawk were taken in any given year, WS' take would represent 0.2% of the estimated population if the population remains at least stable. A population of 5,000 broad-winged hawks would represent approximately 2,500 breeding pairs, WS' removal and destruction of up to five broad-winged hawk nests with eggs would represent 0.2% of the annual nesting activity, if the breeding pairs do not relocate and nest in another location. The take of broad-winged hawk and active broad-winged hawk nests by WS would only occur when permitted and only at levels authorized on depredation permits issued by the USFWS and the CT DEEP.

Red-tailed Hawk Biology and Population Impacts

The red-tailed hawk is probably the most common hawk in North America. Individuals can be observed on almost any car ride of even moderate length, anywhere in Connecticut. Red-tailed hawks soar above open fields, slowly turning circles on their broad, rounded wings or sit atop telephone poles, signs or trees along highways, eyes fixed on the ground to catch the movements of a vole or a rabbit (Preston and Beane 1993).

Requests for assistance with red-tailed hawks received by WS are usually associated with threats to human safety or human injury associated with nesting behavior, but may also involve threats to aircraft from strikes. Some requests for assistance may also involve real or perceived threats to household pets or livestock such as poultry posed by red-tailed hawks that may involve nest aggression or predation.

WS has responded to requests for assistance involving red-tailed hawk previously by providing technical assistance and by providing direct operational assistance through the use of nest removal and destruction, live capture and transport to licensed wildlife rehabilitators, and non-lethal harassment methods. Between FY 2006 and FY 2012, the WS program in Connecticut addressed one red-tailed hawk nest with three red-tailed hawk chicks to manage threats to human safety and human injury due to attack. There were 30 red-tailed hawks non-lethally dispersed by WS at airports, 20 of these during FY 2012. No red-tailed hawks or active red-tailed hawk nests with eggs were lethally taken or destroyed by non-WS entities under depredation permits from 2006 to 2012.

Under the proposed action alternative, WS could be requested to use lethal methods to remove red-tailed hawks when non-lethal harassment methods are ineffective or are determined to be inappropriate for eliminating threats to human health and safety, damage or threats of damage using WS Decision model. Examples could include taking one of a pair of red-tailed hawks where nest and egg destruction was previously used but did not result in the desired outcome of the hawks relocating to a safe nesting site or removal of a broad-wined hawk that poses an immediate strike threat at an airport where attempts to disperse the red-tailed hawk are

ineffective. WS could also live capture dangerous or threatening red-tailed hawks or juvenile hawks and transport them to licensed raptor rehabilitators, falconers, or zoos for temporary or permanent captivity. Based on previous requests for assistance to manage damage associated with red-tailed hawk and in anticipation of receiving an increasing number of requests for assistance, WS could lethally take up to 10 red-tailed hawks and five active red-tailed hawk nests annually to alleviate threats and damage.

Since 1966, the number of red-tailed hawk observed along routes surveyed in the EBBS Regions, New England/Mid-Atlantic Region and Connecticut during the BBS has shown increasing trends estimated at 1.2%, 3.6%, and 4.9% annually (Sauer et al. 2012). The number of red-tailed hawks observed and the number of red-tailed hawks observed per party hour in areas surveyed during the CBC have shown significant increasing trends in the State from 1966 to 2011 in the CBC surveys (NAS 2010). Based on BBS data, Rich et al. (2004) estimated the statewide population of red-tailed hawk was 800 birds. The IUCN (2011) ranks the red-tailed hawk as a species of least concern (USFWS 2006).

Based on a statewide population estimated at 800 red-tailed hawk and if up to 10 red-tailed hawks were taken in any given year, WS' take would represent 1.3% of the estimated population if the population remains at least stable. A population of 800 red-tailed hawks would represent approximately 400 breeding pairs, WS' removal and destruction of up to five red-tailed hawk nests with eggs would represent 1.3% of the annual nesting activity, if the breeding pairs do not relocate and nest in another location. The take of red-tailed hawk and active red-tailed hawk nests by WS would only occur when permitted and only at levels authorized on depredation permits issued by the USFWS and the CT DEEP.

Killdeer Biology and Population Impacts

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

Requests 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 25 killdeer could be lethally taken by WS annually under the proposed action.

From FY 2006 through FY 2012, WS has lethally taken a total of four killdeer at airports to reduce damages and threats associated with aircraft striking killdeer. All killdeer take by WS occurred in FY 2010. In addition, WS has employed non-lethal methods to harass 456 killdeer at airports in the State from FY 2006 through FY 2012. More than 99.1% of the killdeer addressed by WS have been harassed using non-lethal methods since FY 2006.

From 1966 to 2012, the number of killdeer observed on BBS routes in during the breeding season in EBBS Region, New England/Mid-Atlantic Region, and in Connecticut have shown annual declines estimated at -1.6%, -0.5%, and -1.4% respectively (Sauer et al. 2012). The number of killdeer and the number of killdeer per party hour observed during CBC surveys in the State have

shown decreasing trends from 1966 to 2011 (NAS 2010). No current population estimates are available for the number of killdeer residing in the State; however, take of up to 25 killdeer should not significantly impact populations in Connecticut. The IUCN (2011) ranks the killdeer as a species of least concern.

WS will continue to assist airport personnel in identifying habitat and other attractants to killdeer on airport property. Killdeer will 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 CT DEEP.

Gull Biology and Population Impacts

Assessment of Authorized Gull Take

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 Potential Biological Removal (PBR) (Wade 1998, Runge et al. 2004).

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 (BBS, CBC, coordinated colony surveys), and the intrinsic rate of population growth. The formula for PBR is:

$$PBR = \tfrac{1}{2} R_{max} N_{min} F_R$$

where R_{max} is the maximum population growth rate at low densities, and in the absence of removal (Runge et al. 2004), N_{min} is the minimum population size, and F_R is a recovery factor ranging from 0.1 to 2.0. 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).

To estimate R_{max} for great black backed gulls, herring gulls, laughing gulls, and ring-billed gulls, the Slade formula (Slade et al. 1998) was used:

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

where p is adult annual survival rate, l_{α} 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 (λ). Population parameter estimates were taken from the literature for each gull species (Table 4-9), 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 (Table 4-9; Seamans et al. 2007). Population estimates (N_{min}) for each species were based on the number of gulls at known breeding colonies in Bird Conservation Regions (BCRs) 14 and 30 during the mid-1990's (USFWS 2006), and adjusted using a conservative estimate of 0.75 non-breeding gulls per breeder to estimate the total population (Seamans et al. 2007). Allowable take levels (± 95 CI) for each of the 4 gull species under 3 recovery factors (0.5, 1.0, 1.5) in BCRs 14 and 30 are presented in Table 4-10.

Table 4-9. Demographic parameter estimates (θ) used for estimating R_{max} and Potential Biological Removal of gulls in BCR 14 and 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_α	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

Table 4-10. Potential Biological Removal (± 95% CI) of laughing gulls, herring gulls, great black-backed gulls, and ring-billed gulls in Bird Conservation Regions 14 and 30, under 3 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)

Laughing Gull Biology and Population Impacts

The laughing gull is a common gull species found year-round in the southeastern United States with breeding colonies occurring along the coastal areas of the Atlantic Ocean, Gulf of Mexico, and the coastal areas of the Caribbean Islands (Burger 1996). Localized breeding colonies can also be found along the Gulf of California and the Pacific Coast of Mexico (Burger 1996). Burger (1996) cites several sources that indicate laughing gulls are opportunistic foragers feeding

on a wide-range of aquatic and terrestrial invertebrates, small vertebrates, garbage, and plant material, such as berries.

Belant and Dolbeer (1993*a*) estimated the population of breeding laughing gulls in the United States was 258,851 pairs based on state population records. Non-breeding and sub-adult gulls were not considered as part of the breeding population in the United States estimated by Belant and Dolbeer (1993*a*). According to Hammerson (2004) laughing gulls do not nest in Connecticut but may be present during the breeding season. Nesting colonies occur on coastal islands and man-made structures along the coast in neighboring New York and Massachusetts.

In the EBBS and New England/Mid-Atlantic Regions the number of laughing gulls observed along routes surveyed during the BBS has increased annually at estimated rates of 3.2% and 5.1% respectively from 1966 to which are statistically significant increases (Sauer et al. 2012). There are no laughing gull BBS trend estimates available for Connecticut. CBC data indicates the number of laughing gulls observed and number observed per party hour overwintering in the State has been declining since 1966 with no sightings reported after 2000 until the 2012 survey (NAS 2002). In BCR 30, which includes all of coastal Connecticut where laughing gulls could potentially nest in the state, the USFWS (2006) estimates 202,646 breeding pairs of laughing gulls. In BCR 14 which comprises the remainder of Connecticut, there are an estimated 2,704 breeding pairs (USFWS 2006). The Mid-Atlantic/New England/Maritimes Regional Waterbird Conservation Plan ranks the laughing gull as a species of lowest concern (USFWS 2006) and the IUCN (2011) ranks the laughing gull as a species of least concern.

From FY 2006 through FY 2012, the WS program in Connecticut has responded to requests for assistance to manage damage or threats associated with laughing gulls. The number of laughing gulls addressed by WS between FY 2004 and FY 2012 to alleviate damage or threats of damage when requested are shown in Table 4.11. WS live captured 33 laughing gulls in Connecticut and released them after collecting samples for Avian Influenza monitoring between 2006 and 2011. WS has employed non-lethal methods to disperse one laughing gull since FY 2006 to alleviate damage or threats of damage. A total of six laughing gulls have been lethally taken to alleviate damage from 2006 to 2012; of these four were lethally taken by WS.

Table 4.11 – Number of laughing gulls addressed in Connecticut from 2006 to 2012

Year	Dispersed by WS	Take under Depredation Permits		
		WS' Take[1]	Non-WS' Take[2]	Total Reported Take
2006	0	1	0	1
2007	1	0	0	0
2008	0	2	2	4
2009	0	0	0	0
2010	0	1	0	1
2011	0	0	0	0
2012	0	0	0	0
TOTAL	**1**	**4**	**2**	**6**

[1]Data reported by federal fiscal year

[2]Data reported by calendar year

Based on the number of gulls addressed previously by WS in response to requests for assistance, WS anticipates that up to 250 laughing gulls could be lethally taken annually by WS to address requests for assistance under the proposed action alternative. Based on a breeding population estimated at 202,646 pairs in BCR 30 (which does not include non-breeding laughing gulls that

are also present in BCR 30), take of up to 250 gulls annually would represent 0.12% of the estimated breeding population in BCR 30 if the population remains at least stable.

The highest level of take occurred in 2008, when four laughing gulls were lethally taken in the State. When the highest level of take is combined with an annual take of 250 gulls by WS, the cumulative take would be 254 gulls which would represent 0.13% of the estimated breeding population in BCR 30. The cumulative take of laughing gulls is likely to represent a smaller percentage of the actual population in BCR 30 since the breeding population estimate of 202,646 breeding pairs does not include non-breeding laughing gulls. Dolbeer (1998) estimated that the number of non-breeding laughing gulls equaled about 50% of the nesting population.

No take of laughing gulls would occur by WS without the issuance of a depredation permit by the USFWS and the CT DEEP. Therefore, take will only occur as determined and analyzed by the USFWS and the CT DEEP to ensure the desired population objectives for laughing gulls are achieved.

Ring-billed Gull Biology and Population Impacts

Ring-billed gulls are migratory birds which prefer to nest on islands with sparse vegetation. The breeding population of ring-billed gulls is divided into two populations; the western population and the eastern population. The eastern breeding population of the United States includes New York, Vermont, Ohio, Illinois, Michigan, Wisconsin, and Minnesota (Blokpoel and Tessier 1986). Ring-billed gulls nest in high densities and, in the Great Lakes region, nesting colonies may be located on islands, parklands, slag yards, rooftops, breakwalls, and landfills (Blokpoel and Tessier 1986).

Currently there are no known breeding ring-billed gull colonies in Connecticut; however, non-breeding ring-billed gulls can be found during the breeding season. Ring-billed gulls do overwinter across the State. In 1984, the population of ring-billed gulls in the Great Lakes region was estimated at approximately 648,000 pairs (Blokpoel and Tessier 1986). Blokpoel and Tessier (1992) found that the nesting population of ring-billed gulls in the Canadian portion of the lower Great Lakes system increased from 56,000 pairs to 283,000 pairs from 1976-1990. In the EBBS Region, New England/Mid-Atlantic Regions, and Connecticut the number of ring-billed gulls observed during the BBS has increased at estimated rates of 5.0%, 2.0%, and 8.4% annually since 1966 which is also statistically significant (Sauer et al. 2012). The ring-billed gulls observed during the BBS conducted in the State are likely non-breeding gulls since no breeding colonies are known to occur. The number of ring-billed gulls and the number of ring-billed gulls per party hour observed in areas surveyed during the CBC have shown an increasing trend in Connecticut from 1966 to 2011 (NAS 2010).

In BCR 30, which includes all of coastal Connecticut there is no known ring-billed gull nesting (USFWS 2006). In BCR 14 which comprises the remainder of Connecticut, there are an estimated 40,844 breeding pairs (USFWS 2006). The Mid-Atlantic/New England/Maritimes Regional Waterbird Conservation Plan ranks the ring-billed gull as a species of lowest concern (USFWS 2006) and the IUCN (2011) ranks the laughing gull as a species of least concern.

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 ring-billed gulls authorized by the USFWS issued to all entities is shown in Table 4.12.

Table 4.12 – Number of ring-billed gulls addressed in Connecticut from 2006 to 2012

Year	Dispersed by WS	Take under Depredation Permits		
		WS' Take[1]	Non-WS' Take[2]	Total Reported Take
2006	1,485	71	0	71
2007	1,884	87	25	112
2008	2,243	60	0	60
2009	1,782	21	14	35
2010	1,300	24	11	35
2011	437	5	8	13
2012	42	6	10	16
TOTAL	**9,173**	**274**	**68**	**342**

[1]Data reported by federal fiscal year

[2]Data reported by calendar year

From FY 2006 to FY2012, the WS program in Connecticut has addressed 9,173 ring-billed gulls using non-lethal dispersal methods to alleviate damage. In addition, WS has employed lethal methods to lethal take 274 ring-billed gulls from FY 2006 to FY 2012. In addition, the USFWS has issued depredation permits to other entities to alleviate damage or threats of damage associated with ring-billed gulls. From 2006 through 2012, a total of 68 ring-billed gulls have been lethally taken under depredation permits issued by the USFWS by non-WS' entities.

Based on previous requests for assistance and in anticipation of receiving additional requests for assistance, up to 500 ring-billed gulls could be taken annually by WS to address damage and threats of damage. Between 1966 and 2011, an average of 12,491 ring-billed gulls has been observed annually in the State during the CBC (NAS 2010). If 500 ring-billed gulls were taken by WS, WS' take would represent 0.6% of the breeding population in BCR 14 and 4.0% of the average number of ring-billed gulls observed in the State during the CBC from 1966 through 2011. Over this period, the number of gulls observed during the CBC in the State has ranged from a low of 1,066 gulls observed in 1966 to a high of 23,362 gulls observed in 1987 (NAS 2010). Over the latest six years, 2006 to 2011, the average number of ring-billed gulls observed during the CBC in Connecticut has been 14,350 and has ranged from a low of 12,160 gulls observed in 2009 to a high of 19,848 gulls observed in 2008 (NAS 2010). Therefore, if WS had taken 500 ring-billed gulls annually from 2006 through 2011, the annual take by WS would have ranged from a low of 2.5% to a high of 4.1% of the number of gulls observed during the CBC.

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 low magnitude of take occurring by WS when compared to the number of ring-billed gulls 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.

From 2006 through 2012, a total of 68 ring-billed gulls were lethally taken by non-WS' entities under depredation permits issued by the USFWS to alleviate damage and threats of damage which is an average of nearly 10 ring-billed gulls taken annually. If WS had taken 500 ring-billed gulls from FY 2006 through FY 2012, the average annual take by all entities would have increased to 510 gulls taken per year. Therefore, the cumulative take of gulls, if WS had taken 500 gulls per year, would represent 4.1% of the average number of gulls observed in the State during the CBC from 1966 through 2011. The highest level of take occurred in 2007 when 25

ring-billed gulls were lethally taken by all non-WS' entities. If the highest level of non-WS' take is included with the proposed annual take by WS of 500 gulls, the combined take would represent 4.2% of the average number of ring-billed gulls observed during the CBC from 1966 through 2011 and would represent 4.3% of the lowest number of ring-billed gulls observed during the CBC in the State between 2006 and 2011.

Herring Gull Biology and Population Impacts

Herring gulls are the most widely distributed gulls in the Northern Hemisphere. Herring gulls breed in colonies near oceans, lakes, or rivers (Bent 1921). Herring gulls nest along the Atlantic coast and will nest on natural or man-made sites, such as rooftops and break walls. In Connecticut, herring gulls nest on islands in Long Island Sound. Herring gulls also increasingly nest on man-made structures, particularly on rooftops. This has been observed by WS' personnel in Bridgeport, Groton, New Haven, New London, Stamford, and Stratford, Connecticut (T. Cozine Per. Obs. 2013). Herring gulls are considered predatory, feeding on eggs and nestlings of other waterbird species, including terns and plovers (Hunter et al. 2006).

The number of herring gulls observed on the BBS has shown a decreasing trend in the EBBS Region, New England/Mid-Atlantic Region, and Connecticut estimated at annual rates of -3.6%, -5.0, and -4.5 since 1966 (Sauer et al. 2012). Hammerson (2004) estimated the number of breeding pairs at approximately 1,200. According to Dolbeer (1998) the number of non-breeding gulls (sub-adults and non-breeding adults) is estimated to equal about 50% of the nesting population. Therefore, the total herring gull population (breeders and non-breeders) for the state of Connecticut could be estimated at approximately 1,800 gulls. CBC data gathered in Connecticut from 1966 through 2011 indicates the number of herring gulls observed and the number observed per party hour during the survey has shown decreasing trends in the State (NAS 2010).

In BCR 30, which includes all of coastal Connecticut where herring gulls nest in the state, the USFWS (2006) estimates 90,734 breeding pairs of herring gulls. In BCR 14 which comprises the remainder of Connecticut, there are an estimated 196,182 breeding pairs (USFWS 2006). The Mid-Atlantic/New England/Maritimes Regional Waterbird Conservation Plan ranks the herring gull as a species of low concern in BCR 30 and moderate concern in BRC 14(USFWS 2006) while the IUCN (2011) ranks the herring gull as a species of least concern.

Based on previous requests for assistance and in anticipation of receiving additional requests for assistance, up to 1,000 herring gulls could be taken annually by WS to address damage and threats of damage and threats to human health and safety. Between 1966 and 2011, an average of 29,453 herring gulls has been observed annually in the State during the CBC (NAS 2010). If 1,000 herring gulls were taken, WS' take would represent 0.6% of the breeding population in BCR 30 and 3.4% of the average number of herring gulls observed in the State during the CBC from 1966 through 2011. Over this period, the number of herring gulls observed during the CBC in the State has ranged from a low of 9,881 gulls observed in 2011 to a high of 55,016 herring gulls observed in 1984 (NAS 2010). Over the latest six years, 2006 to 2011, the average number of herring gulls observed during the CBC in Connecticut has been 13,146 and has ranged from a low of 9,881 gulls observed in 2011 to a high of 17,490 gulls observed in 2008 (NAS 2010). Therefore, if WS had taken 1,000 herring gulls annually from 2006 through 2011, the annual take by WS would have ranged from a low of 5.7% to a high of 10.1% of the number of gulls observed in the State during the CBC.

A total of 679 herring gulls have been lethally taken by WS in Connecticut from FY 2006 to FY 2012 to manage damage and threats to human safety. During this period, WS has also dispersed 15,524 herring gulls using non-lethal methods as part of an integrated approach to resolving gull damage in Connecticut. Based on the level of take since FY 2006, WS reasonably expects the need to lethally take herring gulls to increase but will not exceed 1,000 herring gulls annually.

Herring gulls have also been lethally taken by other entities in the State to alleviate damage as permitted by the USFWS through the issuance of depredation permits. The number of herring gulls lethally taken in the State by non-WS' entities are shown in Table 4.13. The highest level of herring gull take occurred in 2006 when 201 herring gulls were taken in Connecticut.

The average annual take by all non-WS' entities has averaged 16 gulls annually between 2006 and 2012. When the proposed take by WS of 1,000 gulls is included with the 16 herring gulls taken annually by all non-WS' entities, the cumulative take would represent 7.7% of the average number of gulls observed in the State during the CBC conducted from 2006 through 2011. The highest level of take by all non-WS' entities occurred in 2006 when 79 herring gulls were lethally taken. When WS proposed take of 1,000 gulls annually is included with the highest level of take by all non-WS' entities that has occurred from 2006 through 2011, the cumulative take would represent 8.2% of the average number of herring gulls observed in the State during the CBC between 2006 and 2011. WS' take and the cumulative take of herring gulls likely represents a smaller percentage of the actual number of herring gulls present since non-breeding gulls are not considered in breeding population estimates. However, non-breeding gulls are counted during the CBC conducted annually.

Table 4.13 – Number of herring gulls addressed in Connecticut from 2006 to 2012

		Take under Depredation Permits		
Year	**Dispersed by WS**	**WS' Take[1]**	**Non-WS' Take[2]**	**Total Reported Take**
2006	1,660	122	79	201
2007	4,171	151	1	152
2008	4,014	166	9	175
2009	4,050	143	8	151
2010	706	74	5	79
2011	326	18	8	26
2012	597	5	2	7
TOTAL	**15,524**	**679**	**112**	**791**

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

Impacts due to nest and egg removal and destruction and egg addling and oiling activities should have little adverse impact on the herring gull population regionally and in Connecticut. These two methods are considered non-lethal when conducted before the development of an embryo. Additionally, herring gulls are a long lived species with the ability to identify areas with regular human disturbance and low reproductive success and to relocate and nest elsewhere when confronted with repeated nest failure.

Egg addling or oiling is a similar method but would be used primarily as a population control method, where herring gull eggs are shaken, punctured, frozen, or coated in food grade vegetable oil and returned to the nest for continued incubation. This results in the adult gulls tending the treated eggs until the nesting season has concluded and there is no chance of producing a viable nest. It should have no more impact than nest and egg removal due to the limited number of

nesting individuals it would affect and due to the limited number of occasions WS would employ this method. All nest and egg destruction would occur pursuant to permits authorizing such action by the USFWS.

Although there may be reduced fecundity for the individuals affected, this activity has no long term effect on breeding adult herring gulls. Nest and egg removal and destruction is not used by WS as a population control method. This method is used by WS to inhibit nesting in an area receiving 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 USFWS issues depredation permits that allow for the take of active herring gull nests. These are nests being actively built, nests with adult gulls sitting on them prior to egg laying, nests with eggs, or nests with young chicks. For reporting purposes, the highest number of active nests removed, addled or oiled during a single day at an individual nesting colony is considered the number of active nests destroyed at that site. All subsequent active nests are considered re-nests.

There is no permit requirement to remove and destroy old or inactive gull nests. Herring gull chicks are precocial and usually leave the nest shortly after hatching, at which time the nest is no longer considered active and can be removed without a permit.

Table 4-14 shows the number of nest and re-nests destroyed by WS and the number of nests destroyed by non-WS' entities under permits issued by the USFWS in Connecticut from 2006 to 2012.

Table 4.14 – Number of herring gull nests addressed in Connecticut from 2006 to 2012

	Take under Depredation Permits			
Year	**WS' Nest Take**	**WS' Re-nests**	**Non-WS' Nests[1]**	**Total Nests[2]**
2006	392	826	75	467
2007	225	430	122	347
2008	182	294	157	339
2009	184	273	125	309
2010	164	288	109	273
2011	143	164	152	295
2012	57	83	85	142
TOTAL	**1,347**	**2,358**	**825**	**2,172**

[1]Non-WS' Nests may include both new nests and re-nests but are assumed to be new nests
[2]Total nests includes WS' nest take and non-WS' nest take, does not include WS' re-nests

Great Black-backed Gull Population Effects

The great black-backed gull is basically a marine species, which breeds in the North Atlantic region. In the United States the great black-backed gull breeds south to Long Island (Bull 1974). During the winter these gulls can also be found along the Great Lakes and larger rivers, such as the St. Lawrence River (Angehrn et al. 1979, Bull 1974). The over-wintering population of great black-backed gull has been increasing along the Great Lakes, along with the expansion of their breeding range (Angehrn et al. 1979).

In Connecticut, great black-backed gulls nest on islands in Long Island Sound and also on man-made structures, particularly on rooftops. This has been observed by WS' personnel in Bridgeport, Groton, New Haven, Stonington, and Stratford, Connecticut (T. Cozine Per. Obs., A. Maikshilo Per. Comm. 2010, and E. Shaffer Per. Comm. 2012). Great black-backed gulls are

considered predatory, feeding on eggs and nestlings of other waterbird species, including terns and plovers (Hunter et al. 2006).

In BCR 30, which includes all of coastal Connecticut where great black-backed gulls nest in the state, the USFWS (2006) estimates 37,372 breeding pairs of great black-backed gulls. In BCR 14 which comprises the remainder of Connecticut, there are an estimated 115,546 breeding pairs (USFWS 2006). The Mid-Atlantic/New England/Maritimes Regional Waterbird Conservation Plan ranks the great black-backed gull as a species of lowest concern in BCR 30 and low concern in BRC 14(USFWS 2006) while the IUCN (2011) ranks the great black-backed gull as a species of least concern.

Data from the BBS (1966-2011) shows that the great black-backed gull population in the Eastern BBS Region has declined at an annual rate of -2.5%, while in the New England/Mid-Atlantic Region it has increased at an annual rate of 3.3% (Sauer et al. 2012). There are no BBS trend estimates available for the great black-backed gull in Connecticut. Canada Wildlife Service reports that the population figures for the great black-backed gull populations in the Northeast (i.e., along the St. Lawrence River) have soared from the early 1980's to the late 1990's (Canadian Wildlife Service 2002). CBC data gathered in Connecticut from 1966 through 2011 indicates the number and number per party hour of great black-backed gulls observed during the survey has shown a general decreasing trend in the State (NAS 2010).

Hammerson (2004) estimated the number of breeding pairs of great black-backed gulls at greater than 500 in Connecticut. According to Dolbeer (1998) the number of non-breeding gulls (sub-adults and non-breeding adults) is estimated to equal about 50% of the nesting population. Therefore the total great black-backed gull population (breeders and non-breeders) for the State of Connecticut could be estimated at approximately 750 great black-backed gulls.

A total of 40 great black-backed gulls have been lethally taken by WS in Connecticut from FY 2006 to FY 2012 to manage damage and threats to human safety. During this period, WS has also dispersed 247 black-backed gulls using non-lethal methods as part of an integrated approach to resolving gull damage. Based on previous requests for assistance and in anticipation of receiving additional requests for assistance, up to 250 great black-backed gulls could be taken annually by WS to address damage and threats of damage and threats to human health and safety. Between 1966 and 2011, an average of 2,090 great black-backed gulls has been observed annually in the State during the CBC (NAS 2010). If 250 great black-backed gulls were taken by WS, WS' take would represent 0.5% of the Southern New England breeding populations, 0.3% of the breeding population in BCR 30 and 0.1% of the breeding population in BCR 14 (USFWS 2006). Take of 250 great black-backed gulls would represent 12.0% of the average number of great black-backed gulls observed in the State during the CBC from 1966 through 2011. Over this period, the number of great black-backed gulls observed during the CBC in the State has ranged from a low of 490 great black-backed gulls observed in 1966 to a high of 4,769 great black-backed gulls observed in 1984 (NAS 2002). Over the latest six years, 2006 to 2011, the average number of great black-backed gulls observed during the CBC in Connecticut has been 870 and has ranged from a low of 575 gulls observed in 2011 to a high of 1,061 gulls observed in 2009 (NAS 2002).

Great black-backed gulls have also been lethally taken by other entities to alleviate damage as permitted by the USFWS through the issuance of depredation permits. The number of great black-backed gulls lethally taken by non-WS' entities are shown in Table 4.15. The highest level of great black-backed gull take occurred in 2008 when 17 great black-backed gulls were taken in Connecticut.

Table 4.15 – Number of great black-backed gulls addressed in Connecticut from 2006 to 2012

Year	Dispersed by WS	Take under Depredation Permits		
		WS' Take[1]	Non-WS' Take[2]	Total Reported Take
2006	0	0	0	0
2007	18	6	0	6
2008	80	8	9	17
2009	109	16	0	16
2010	18	8	5	13
2011	17	1	9	10
2012	5	1	0	1
TOTAL	**247**	**40**	**23**	**63**

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

As with herring gulls, impacts due to nest and egg removal and destruction and egg addling and oiling activities should have little adverse impact on the great black-backed gull population regionally and in Connecticut. These two methods are considered non-lethal when conducted before the development of an embryo. Additionally, great black-backed gulls are a long lived species with the ability to identify areas with regular human disturbance and low reproductive success and to relocate and nest elsewhere when confronted with repeated nest failure.

The total number of nests and eggs reported as destroyed in Connecticut are listed in table 4-16. The highest numbers of nests destroyed were reported in 2009 and 2010 when 15 nests were reported annually as destroyed by all entities in Connecticut. Table 4-16 shows the number of nest and re-nests destroyed by WS and the number of nests destroyed by non-WS' entities under permits issued by the USFWS in Connecticut from 2006 to 2011.

Table 4.16 – Number of great black-backed gull nests addressed in Connecticut from 2006 to 2012

Year	Take under Depredation Permits			
	WS' Nest Take	WS' Re-nests	Non-WS' Nests[1]	Total Nests[2]
2006	4	0	3	7
2007	1	0	0	1
2008	2	1	0	2
2009	3	1	12	15
2010	3	3	12	15
2011	5	0	15	20
2012	1	0	10	11
TOTAL	**19**	**5**	**52**	**71**

[1]Non-WS' Nests may include both new nests and re-nests but are assumed to be new nests
[2]Total nests includes WS' nest take and non-WS' nest take, does not include WS' re-nests

Based upon the above information, WS potential impacts to populations of great black-backed gulls has been and is expected to continue to be insignificant to the overall viability and reproductive success of this bird species population on a local, regional, and nationwide scale. WS' anticipated take of up to 250 great black-backed gulls annually will not have a negative impact on populations in Connecticut or regionally. The PBR model, based on FR = 1.0, predicts take of 11,234 great black-backed gulls would not adversely impact gulls populations in BCR 14 or BCR 30 (See Table 4-9). WS' annually reports take of gulls to the USFWS to ensure take by

WS is incorporated and evaluated in population objectives established by the USFWS for gull species in Connecticut and regionally.

Mourning Doves Biology and Population Impacts

Mourning doves are migratory birds with substantial populations throughout much of North America. Mourning doves are considered a migratory game species in many States outside the Northeast, and have regulated annual hunting seasons. Rhode Island is the only state neighboring Connecticut that allows dove hunting.

According to BBS trend data provided by Sauer et al. (2012), mourning dove populations have increased at an annual rate of 0.4% in the Eastern BBS Region, 0.3% in the New England/Mid-Atlantic Region, and 0.9% Connecticut from 1966 to 2011. The Partners in Flight population database estimated the mourning dove population in Connecticut to be 140,000 mourning doves (Rich et al. 2004). From 2006 through 2012, the number of mourning doves heard and seen per route during surveys conducted in New England, which includes Connecticut, has shown increase in the region (Seamans et al. 2012). The number of doves heard and observed during mourning dove abundance surveys in the Eastern Mourning Dove Management Area has increased annually between 2002 and 2011 at an estimated rate of 0.2% annually (Seamans et al. 2012). The number of doves heard and observed during mourning dove abundance surveys in the New England Mourning Dove Management Area has decreased annually between 2002 and 2011 at an estimated rate of -1.1% annually (Seamans et al. 2012). CBC data gathered in Connecticut from 1966 through 2011 shows a slightly increasing trend in the overall number of mourning doves (NAS 2010). However, the CBC data shows a decrease in the number of mourning doves observed per party hour (NAS 2010). The IUCN (2011) ranks the mourning dove as a species of least concern.

From FY 2006 through FY 2012, WS has non-lethally addressed 433 mourning doves and lethally addressed 17 doves to alleviate damage and threats (see Table 4.17). The take of doves by other entities to alleviate damage or the threat of damage under depredation permits is also shown on Table 4.17. Requests for assistance received by WS 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, up to 500 mourning doves could be lethally taken by WS annually to address damage or threats.

As mentioned previously, mourning doves maintain sufficient population levels to sustain an annual harvest in a number of states including neighboring Rhode Island. More than 16.58 million mourning doves were estimated harvested in the United States during the 2011 seasons (Seamans et al. 2012) which was similar to the over 17.2 million doves harvested during the 2010 season (Seamans et al. 2011). As a non-hunting state, no mourning doves have been harvested in Connecticut.

An annual take by WS of up to 500 mourning doves would represent 0.4% of the estimated statewide population of 140,000 doves based on a stable population trend. Local populations of mourning doves are likely augmented by migrating birds during the migration periods and during the winter months. Like other native bird species, the take of mourning doves by WS to alleviate damage will only occur when permitted by the USFWS pursuant to the MBTA through the issuance of depredation permits. Therefore, the take of mourning doves by WS will only occur and only at levels authorized by the USFWS and the CT DEEP which ensures WS' take and take by all entities are considered to achieve the desired population management levels of doves.

Table 4.17 – Number of mourning doves addressed in Connecticut from FY 2006 to FY 2012

Year	Dispersed by WS	Take under Depredation Permits		
		WS' Take[1]	Non-WS' Take[2]	Total Reported Take
2006	0	0	0	0
2007	1	0	0	0
2008	67	0	4	4
2009	23	5	2	7
2010	125	8	3	11
2011	154	0	2	2
2012	63	4	0	4
TOTAL	**433**	**17**	**11**	**28**

Monk Parakeet Biology and Population Impacts

The monk parakeet is a native of South America, occurring from Bolivia to southern Brazil to central Argentina. The species has been introduced and become established as a breeding species in the United States and Europe (Spreyer and Bucher 1998). Monk parakeets became established in the United States in the 1960s as a result of accidental and intentional releases by individuals or pet shops.

The monk parakeet is the only parrot that builds a stick nest, in a tree or on a man-made structure, rather than using a hole in a tree. In addition to nest building, the species is gregarious and normally nests colonially, building a single large nest with separate entrances for each pair. The colonies can become quite large and in exceptional cases, these stick nests may have more than 200 chambers, but most have only 1 to 20 (Spreyer and Bucher 1998). The size of the nest varies with the size of the supporting structure; in exceptional cases, compound nests weighing 1,200 kg (2,646 lbs) have been reported (Spreyer and Bucher 1998). Nest maintenance is a year-round activity and all members of the colony, including sexually immature birds will add sticks to the nest (Bull 1973, Spreyer and Bucher 1998). Monk parakeets are relatively common coastal southwest Connecticut in urban and suburban areas where they nest in trees and on utility poles.

No BBS population trend data is available for the monk parakeet in the Eastern BBS Region, New England/Mid-Atlantic Region or Connecticut. CBC data from 1974, the first year where the monk parakeet was reported in Connecticut, through 2011 shows an increasing trend for the number of monk parakeets observed and the number observed per party hour wintering in Connecticut (NAS 2010). However, from 2006 to 2011, CBC data indicate a decreasing trend in the number and number per party hour of monk parakeets observed in Connecticut (NAS 2010). No population estimates are currently available for the monk parakeet in Connecticut. From 2006 to 2011, an average of 432 parakeets has been observed annually during CBC surveys and has ranged from a low of 228 birds observed in 2010 to a high of 651 birds observed in 2006 (NAS 2010).

From FY 2006 through FY 2012, a total of 189 monk parakeets have been lethally taken by WS to alleviate damage. This entire take occurred in FY 2006. Monk parakeets are not protected federally under the MBTA because they are considered an invasive exotic species. They are specifically exempted from protection under Connecticut law when causing or about to cause damage or threats to human safety under Title 26; Chapter 490, Section 26-92 wild birds other than game birds protected, exception. Because there is no reporting requirement, the number of monk parakeets taken annually by non-WS' entities is unknown. Based on the number of requests received to alleviate the threat of damage associated with monk parakeets and the

number of monk parakeets addressed previously to alleviate those threats, WS anticipates that up to 100 monk parakeets could be taken annually to alleviate the threat of damage.

WS' take of up to 100 monk parakeets would represent 23.2% of the average number observed during CBC surveys during this period. Therefore, if WS had taken 100 monk parakeets annually from 2006 through 2011 in the State, the annual take by WS would have ranged from a low of 15.4% to a high of 43.9% of the number of monk parakeets observed during the CBC. The IUCN (2011) ranks the monk parakeet as a species of least concern.

Although take could occur by other entities, the take of monk parakeets will not likely reach a magnitude where adverse effects to monk parakeet populations would occur from take to alleviate damage or threats. Because monk parakeets are considered an invasive, exotic species, any lethal take by WS' could be considered environmentally beneficial. WS' is required to provide for the control of invasive species, and to minimize the economic, ecological, and human health impacts that invasive species cause by Presidential Order.

American Crow Biology and Population Impacts

American crows have a wide range and are extremely abundant, being found across the United States (Verbeek and Caffrey 2002). Crows are found in both urban and rural environments and in Connecticut sometimes forming large communal roosts in cities. In the United States, some crow roosts may reach a half-million birds (Verbeek and Caffrey 2002). American crows are found throughout the State and can be found throughout the year (Robbins and Blom 1996).

Historically, crow populations have benefited from agricultural development because of grains available as a food supply. Crows typically roost in trees with the combination of food and tree availability being favored. In some areas where abundant food and roosting sites are available, large flocks of crows tend to concentrate. 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 from 6 to 12 miles from a 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.

As discussed previously, blackbirds, including crows, can be taken without a depredation permit issued by the USFWS when committing or about to commit damage or posing a threat to human safety under a blackbird depredation order (see 50 CFR 21.43). In addition, crows can be harvested during a regulated season that allows an unlimited number of crows to be harvested. The number of crows taken in the State under the depredation order to alleviate damage or reduce threats is currently unknown because a reporting requirement was not implemented until 2011. Additionally, hunters harvesting crows during the regulated hunting season are not required to report their take to the USFWS or the CT DEEP.

The American crow population in Connecticut has been estimated at 73,000 crows based on BBS data (Rich et al. 2004). From 1966 through 2011, trend data from the BBS indicates the number of American crows observed in the Eastern BBS Region, New England/Mid-Atlantic Region, and Connecticut during the survey has increased at annual rates of 0.5%, 0.9%, and 1.6%, respectively (Sauer et al. 2012). The number of American crows observed and number observed per party hour in Connecticut in areas surveyed during the CBC have shown increasing trends from1966 to 2011 (NAS 2010). Between 1966 and 2011, observers conducting surveys for the CBC have counted an average of 30,048 American crows annually in the State (NAS 2010). The

fewest number of crows observed during the CBC occurred in 1968 when 5,910 crows were observed (NAS 2010). The highest number of crows observed during the CBC occurred in 1999 when 85,935 crows were counted (NAS 2010). As has been stated previously, the data available from the CBC is intended to provide long-term trending information. However, the information on the actual number of crows observed in areas surveyed during the CBC conducted in the State is provided here to evaluate the magnitude of WS' proposed take on the number of crows that could be present in the State. The number of crows observed by surveyors during the CBC would be considered minimum estimates since not all areas of the State are surveyed during the CBC. The IUCN (2011) ranks the American crow as a species of least concern.

From FY 2006 through FY 2012, WS has employed lethal methods to take 611 American crows in Connecticut and employed non-lethal methods to disperse 118,982 crows (see Table 4-18). Based on the requests for assistance received previously and the relative abundance of crows, WS anticipates that up to 500 American crows could be lethally taken annually to resolve requests for assistance. With a statewide population estimated at 73,000 American crows, an annual take by WS of 500 crows would represent 0.7% of the estimated population if the population remains stable. The take of up to 500 crows by WS annually would represent 1.7% of the average number of crows observed in the State in areas surveyed during the CBC from 1966 to 2011. Between 2006 and 2011, the lowest number of crows observed during the CBC was 20,967 American crows during 2008. If WS had lethally taken 500 crows in 2008, the take would have represent 2.4% of the number of crows observed. However, the number of crows observed during the CBC would be considered a minimum since not all areas of the State are surveyed.

Table 4.18 – Number of American crows addressed in Connecticut by WS from FY 2006 to FY 2012

Year	Dispersed by WS	WS' Take[1]
2006	22,413	20
2007	5,005	26
2008	58,092	356
2009	12,102	55
2010	6,238	18
2011	9,376	97
2012	5,756	39
TOTAL	**118,982**	**611**

Given the relative abundance of American crows and the long-term stable to increasing population trends observed for the species, the take of crows by other entities to alleviate damage or threats of damage and the take of crows during the annual hunting season is likely of low magnitude. The use of population trends as an index of magnitude is based on the assumption that annual harvests do not exceed allowable harvest levels. State wildlife management agencies act to avoid over-harvests by restricting take (either through hunting season regulation and/or permitted take) to ensure that annual harvests are within allowable harvest levels. The take of crows under the depredation order by other entities is likely to be a small contributor to the cumulative take of crows annually. Although some take is likely to occur, take is not expected to reach a high magnitude. Similarly, the take of crows during the annual hunting season is likely of low magnitude when compared to the statewide population. Given that the number of American crows observed during statewide surveys are showing increasing trends (NAS 2010, Sauer et al. 2012), the population of crows have not declined since those population estimates were calculated and have likely remained at least stable despite the take of crows by WS and other entities under the depredation order and during the annual hunting season.

Fish Crow Biology and Population Impacts

Fish crows are similar to the American crow in coloration, body weight and length. The diet of fish crows is also similar but with a higher intake of aquatic organisms. This is due to their preferred feeding habitat of tidal flats, beaches, rookeries, and brackish waterways. The major differences between the two species are their range and calls. Fish crows tend to be a coastal species that spends much of its time along the Atlantic and Gulf coast from southern New England to Florida. However, it is not unlikely for them to be observed inland feeding and roosting alongside flocks of American crows.

The breeding and wintering habitat of fish crows consists of wooded marine shorelines, coastal marshes and inland wetlands along tidal rivers. Nesting behavior of fish crows are also similar to American crows, however, they do nest higher at approximately 20 to 80 feet above the ground and build slightly smaller nests (RIDEM 2012). Inland from the coast, fish crows are generally found in large river drainages, although they may feed in woods or fields a few miles from water (Kaufman 1996). Hamel (1992) specifies viable inland habitats as lake shores, pinewoods, and occasionally in towns, residential, or other urban areas.

Given the similar physical appearance of the two species, estimating the number of individual fish crows or American crows in a roost or flock of crows based on visual cues can be difficult. Isolating and distinguishing the vocalizations of an individual crow for species identification in a mixed species flock of crows can also be difficult.

Between FY 2006 and FY 2012, no fish crows were lethally taken by WS to alleviate damage nor were any fish crows known to have been dispersed using non-lethal methods by WS. Like American crows, fish crows can be taken without a depredation permit issued by the USFWS when committing or about to commit damage or posing a threat to human safety under a blackbird depredation order (see 50 CFR 21.43). In addition, fish crows can be harvested during a regulated season that allows an unlimited number of crows to be harvested. As with American crowns, the number of fish crows taken in the State under the depredation order to alleviate damage or reduce threats is currently unknown because the reporting requirement was not implemented until 2011. Additionally, hunters harvesting crows during the regulated hunting season are not required to report their take to the USFWS or the CT DEEP.

Fish crows are not as abundant as American crows and are not as widely distributed across the State. American crows can be found throughout the State while fish crows are most commonly found in the coast of Connecticut and along the rivers. From 1966 through 2011, trend data from the BBS indicates the number of fish crows observed in the Eastern BBS Region, New England/Mid-Atlantic Region, and Connecticut during the survey has increased at annual rates of 0.1%, 2.9%, and 13.2%, respectively (Sauer et al. 2012). Although fish crows and American crows form mixed species flocks, most flocks of crows or crow roosts encountered is the State consists primarily of American crows. Based on previous requests for assistance with American crows and in anticipation of requests to disperse urban crow roosts, up to 100 fish crows could be taken by WS annually under the proposed action. Although not as abundant in the State, fish crows could be present in flocks of crows addressed by WS. The number of fish crows observed and the number observed per party hour during the CBC have shown an increasing trend from 1966 to 2011 (NAS 2010). Rich et al. (2004) estimated the statewide population of fish crows at 400 birds based on BBS data. The IUCN (2011) ranks the fish crow as a species of least concern.

If up to 100 fish crows were lethally taken annually by WS, WS' take would represent 25.0% of the estimated statewide population of fish crows. Similar to American crows, the number of fish

crows taken annually to alleviate damage or taken during the annual hunting season in the State is unknown. However, given the relative abundance of fish crows when compared to the abundance of American crows and given the more specific habitat preferences of fish crows, the number of fish crows taken or harvested annually is likely to represent a small portion of the total take of crows in the State.

WS anticipates that the take of fish crows will be limited and would most likely occur in conjunction with requests for assistance to manage damage associated with urban crow roosts where American crows and fish crows occur in mixed species flocks. Trend data from the BBS indicate the number of fish crows observed along routes surveyed have increased from 1966 to 2011. Data from the CBC also indicates the number of fish crows observed overwintering in the State have shown an increasing trend. Although the take that could occur by WS under the proposed action could be considered of high magnitude when compared to the estimated statewide breeding population, it is believed that the number of fish crows in the State is underestimated due to the similarity to American crows. Also, based on trend data, the population of fish crows in Connecticut is increasing. WS anticipates the possibility of taking fish crows annually to protect threatened and endangered species such as piping plovers, at coastal airports, and during management activities under the proposed action to address urban crow roosts.

Red-winged Blackbird Biology and Population Impacts

The red-winged blackbird is by far the most common member of the blackbird group, and its range extends from Canada to the West Indies and Costa Rica (Peterson 1980). Red-winged blackbirds are abundant in marshes, fields, and woods, where they consume insects, small fruits, wild seeds, grain and small aquatic life (Peterson 1980). Clutch size ranges from three to five eggs (Bull and Farrand 1977). Red-winged blackbirds nest throughout much of North America and migrate to winter and winter in the southern United States (Dolbeer 1994).

As reported by the BBS, populations of red-winged blackbirds have decreased from 1966 to 2011 at estimated rates of -1.4%, -1.9%, and -3.0% annually in the Eastern BBS Region, New England/Mid-Atlantic Region and Connecticut respectively (Sauer et al. 2012). CBC data from 1966 through 2011 shows a declining trend in both number and number per party hour of red-winged blackbirds observed wintering in Connecticut (NAS 2010). The Partners in Flight Landbird database estimated the population of red-winged blackbirds in Connecticut to be 100,000 birds (Rich et al. 2004). The IUCN (2011) ranks the red-winged blackbird as a species of least concern.

From FY 2006 through FY 2012, a total of 933 red-winged blackbirds were dispersed by WS and five red-winged blackbirds have been lethally taken by WS to alleviate damage pursuant to the blackbird depredation order (see Table 4.19). Red-winged blackbirds are covered under the blackbird depredation order and can be taken without a depredation permit issued by the USFWS when committing or about to commit damage or posing a threat to human safety (see 50 CFR 21.43). Red-winged blackbirds are not specifically exempted from protection under Connecticut law as are exotic species such as house sparrows and European starlings or other species listed in the blackbird depredation orders such as crows and brown-headed cowbirds under Title 26; Chapter 490, Section 26-92 wild birds other than game birds protected, exception. As a result, before conducting any non-airport related red-winged blackbird control program, WS will contact CTDEEP and obtain appropriate authorization before conducting any lethal control.

Non-WS's take of red-winged blackbirds is currently unknown because the reporting requirement was not implemented until 2011. Based on the number of requests received to alleviate the threat of damage associated with red-winged blackbirds and the number of blackbirds addressed previously to alleviate those threats, WS anticipates that up to 1,000 red-winged blackbirds could be taken annually to alleviate the threat of damage.

Table 4.19 – Number of red-winged blackbirds addressed in Connecticut by WS from 2006 to 2012

Fiscal Year	Dispersed by WS	WS' Take
2006	0	0
2007	0	5
2008	312	0
2009	400	0
2010	50	0
2011	121	0
2012	50	0
TOTAL	**933**	**5**

Based on the estimated population, WS' take of up to 1,000 red-winged blackbirds would represent 1.0% of the estimated population. Although take could occur by other entities as authorized by the USFWS under the depredation order and CTDEEP permitting, the take of red-winged blackbirds will not likely reach a magnitude where adverse effects to red-winged blackbirds populations would occur from take to alleviate damage or threats. The inclusion of red-winged blackbirds under the blackbird depredation order issued by the USFWS pursuant to the MBTA indicates that the USFWS does not anticipate cumulative take of red-winged blackbirds will be have an adverse impact on the population red-winged blackbirds.

Common Grackle Biology and Population Impacts

The common grackle occupies a range that includes Canada and the United States east of the Rockies (Peterson 1980). This bird inhabits croplands, fields, parks, lawns, and open woodland (Bull and Farrand 1977). The grackle has an extremely varied diet, which includes insects, crayfish, frogs, other small aquatic life, mice, nestling birds, eggs, sprouting and ripened grains, seeds, and fruit (Bull and Farrand 1977, Peterson 1980). These birds form large flocks during migration and in winter roosts and often form breeding colonies. Common grackles usually nest in tall evergreens and have clutch size of five eggs. Common grackles nest throughout much of North America east of the Rocky Mountains and migrate to and winter in the southern United States (Dolbeer 1994). However, southern Connecticut is well within the wintering range of common grackles and a flock numbering over 25,000 individuals was observed by WS personnel in January, 2012 (T. Cozine Pers. Obs. 2012).

The open areas found at airports makes the habitat ideal for flocks of foraging grackles during fall and winter and forest and wetland areas on or adjacent to airports provide nest sites an foraging sites during the spring and summer. Most requests for assistance to reduce threats associated with grackles occur at airports in Connecticut. However, flocks of grackles can consume and contaminate livestock feed, damage ripening sweet and field corn. In neighboring Massachusetts during the breeding season, WS regularly received complaints of nesting grackles dropping "fecal sacs" that have been removed from the nest into swimming pools. Young grackles excrete waste encased in these gelatinous sacs, an adaptation that promotes a clean nest. Grackles dispose of the fecal sacs of their young into the closest body of water (Mass Audubon 2012). This is done to

reduce the attraction to ground based predators such as raccoons, fishers, and snakes that could be cued to the presence of chicks if the droppings simply accumulated on the ground beneath the nest.

As reported by the BBS, populations of common crackles have decreased from 1966 to 2011 at estimated rates of -1.9%, -2.1%, and -1.2% annually in the Eastern BBS Region, New England/Mid-Atlantic Region and Connecticut respectively (Sauer et al. 2012). CBC data from 1966 through 2011 shows a declining trend in both number and number per party hour of grackles observed wintering in Connecticut (NAS 2010). The Partners in Flight Landbird database estimated the population of common crackles in Connecticut to be 160,000 birds (Rich et al. 2004). The IUCN (2011) ranks the common grackle as a species of least concern.

From FY 2006 through FY 2012, a total of 996 grackles were dispersed by WS and one grackle has been lethally taken by WS to alleviate damage pursuant to the blackbird depredation order (see Table 4.20). Common grackles are covered under the blackbird depredation order and can be taken without a depredation permit issued by the USFWS when committing or about to commit damage or posing a threat to human safety (see 50 CFR 21.43). Like red-winged blackbirds, common grackles are not specifically exempted from protection under Connecticut law under Title 26; Chapter 490, Section 26-92 wild birds other than game birds protected, exception. As a result, before conducting any non-airport related grackle control program, WS will contact CTDEEP and obtain appropriate authorization before conducting any lethal control.

Non-WS's take is currently unknown. Based on the number of requests received to alleviate the threat of damage associated with grackles and the number of grackles addressed previously to alleviate those threats, WS anticipates that up to 1,000 grackles could be taken annually to alleviate the threat of damage.

Table 4.20 – Number of common grackles addressed in Connecticut by WS from 2006 to 2012

Fiscal Year	Dispersed by WS	WS' Take
2006	0	0
2007	0	0
2008	550	0
2009	330	0
2010	0	0
2011	96	1
2012	20	0
TOTAL	**996**	**1**

Based on the estimated population, WS' take of up to 1,000 common grackles would represent 0.6% of the estimated population. Although take could occur by other entities as authorized by the USFWS under the depredation order and CTDEEP permitting, the take of grackles will not likely reach a magnitude where adverse effects to grackles populations would occur from take to alleviate damage or threats. The inclusion of common grackles under the blackbird depredation order issued by the USFWS pursuant to the MBTA indicates that the USFWS does not anticipate cumulative take of grackles will be have an adverse impact on the population common grackles.

Brown-headed Cowbird Biology and Population Impacts

The brown-headed cowbird is the smallest member of the blackbird group. It is common throughout the United States and is found near livestock, and in flocks of mixed blackbird species. This bird inhabits agricultural land, fields, woodland edges, and suburban areas (Bull and Farrand 1977). The preferred food of brown-headed cowbirds includes insects, small fruits, wild seeds, grain and small aquatic life (Peterson 1980). It is a social parasite that often lays its eggs in the nests of rarer bird species. Cowbirds occur throughout much of North America in the spring and migrate to over winter in the central and southern United States (Dolbeer 1994). BBS

As reported by the BBS, populations of brown-headed cowbirds have decreased from 1966 to 2011 at estimated rates of -1.6% in the Eastern BBS Region, have increased at an estimated rate of 0.3% in the New England/Mid-Atlantic Region, and remained stable in Connecticut with 0.0% change (Sauer et al. 2012). CBC data from 1966 through 2011 shows a declining trend in both number and number per party hour of brown-headed cowbirds observed wintering in Connecticut (NAS 2010). The Partners in Flight Landbird database estimated the population of brown-headed cowbirds in Connecticut to be 40,000 birds (Rich et al. 2004). The IUCN (2011) ranks the brown-headed cowbird as a species of least concern.

From FY 2006 through FY 2012, a total of 2,260 cowbirds were dispersed by WS and a total of 332 cowbirds have been lethally taken by WS to alleviate damage pursuant to depredation permits (see Table 4.21). Non-WS's take of cowbirds is currently unknown. Based on the number of requests received to alleviate the threat of damage associated with cowbirds and the number of cowbirds addressed previously to alleviate those threats, WS anticipates that up to 1,000 brown-headed cowbirds could be taken annually to alleviate the threat of damage.

Based on the estimated population, WS' take of up to 1,000 cowbirds would represent 2.5% of the estimated population. Although take could occur by other entities as authorized by the USFWS under the depredation order and Connecticut law, the take of cowbirds will not likely reach a magnitude where adverse effects to cowbirds populations would occur from take to alleviate damage or threats. The inclusion of brown-headed cowbirds under the depredation order issued by the USFWS and the exemption from protection under Connecticut law (Title 26; Chapter 490, Section 26-92) indicate that neither the USFWS or CTDEEP believe depredation activities will adversely affect the cowbird population in Connecticut.

Table 4.21 – Number of brown-headed cowbirds addressed in Connecticut by WS from 2006 to 2012

Fiscal Year	Dispersed by WS	WS' Take
2006	1450	136
2007	125	131
2008	0	45
2009	185	0
2010	0	4
2011	250	8
2012	250	8
TOTAL	**2,260**	**332**

Additional Target Species

In addition to the 27 bird species analyzed previously, additional target species have been lethally taken or removed from the wild in small numbers by WS from 2006 to 2012, and have included no more than 20 individuals and/or 10 nests of the following 13 species: great egrets, cattle egrets, snowy egrets, gadwall, hooded merganser, feral domestic geese, ring-necked pheasant, black-bellied plovers, semi-palmated sandpiper, downy woodpeckers, snow buntings, bank swallow, and Northern mockingbird.

There were 29 species targeted solely for non-lethal dispersal from 2006 to 2012; these were Northern cardinal, gray catbird, short-billed dowitcher, bufflehead, common goldeneye, common merganser, red-breasted merganser, white-winged scoter, green-winged teal, American wigeon, wood duck, American kestrel, Atlantic brant, sharp-shinned hawk, Cooper's hawk, glossy ibis, horned lark, common loon, American golden plover, semi-palmated plover, American robin, least sandpiper, Wilson's snipe, barn swallow, tree swallow, common tern, American woodcock, greater yellowlegs and lesser yellowlegs. Many of these species were harassed at airports and may have been lethally taken if they had not responded to harassment.

Based on previous requests for assistance and the take levels necessary to alleviate those requests for assistance, no more than 20 individuals of any of these 42 species could be taken annually by WS in the State. In addition, up to 10 nests of those species could be destroyed annually by WS to alleviate damage or discourage nesting in areas where damages are occurring. 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 from take under the MBTA, and the 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 CT DEEP 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. In addition, any take of the above species in accordance with an issued federal and state permit will be reported to the USFWS and CT DEEP annually.

Feral geese and feral ducks are not afforded protection under the MBTA and are considered non-native species in Connecticut. The take of those species can occur without the need for a depredation permit from the USFWS and the CT DEEP. 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.

Bufflehead, gadwall, common goldeneye, common merganser, hooded merganser, red-breasted merganser, white-winged scoter, green-winged teal, American wigeon, wood ducks, Atlantic brant, ring-necked pheasant, Wilson's snipe, and American woodcock maintain sufficient population densities to allow for annual harvest seasons. The proposed take of up to 20 individuals of those species, including up to 10 nests, under the proposed action would be a minor component of the annual take of those species during the regulated hunting seasons.

Based on the potential for unexpected requests for assistance and the take levels necessary to alleviate those requests for assistance, no more than five individuals of any other federally and/or state non-threatened or non-endangered native bird species which currently occurs in

Connecticut, any North American bird species that expands its range into Connecticut, any newly introduced invasive, exotic bird species found in Connecticut, or any feral/free ranging domestic or pet bird species in may occur in the future could be taken annually by WS. In addition, up to five nests of such species could be destroyed annually by WS to alleviate damage or discourage nesting in areas where damages are occurring. Take of up to five individuals or nests of any bird species that is not federally or state listed as endangered, threatened or of special concern by WS would not adversely affect populations of those species. Most of the bird species that may need to be taken unexpectedly are afforded protection from take under the MBTA and the take is only allowed through the issuance of a depredation permit and only at those levels stipulated in the permit. Any other native bird species, such as ruffed grouse or bobwhite quail that are not afforded protection by the MBTA would receive protection from CT DEEP. 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 CT DEEP permitting processes. The USFWS, as the agency with management responsibility for migratory birds and CT DEEP with management responsibility for resident birds and oversight of migratory birds within Connecticut, 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. In addition, any take of the above species in accordance with an issued federal and state permit will be reported to the USFWS and CT DEEP annually. This take may not necessarily occur to reduce damage or threats to human health and safety. For example, lethal take may occur if an injured bird is humanely euthanized by WS personnel that reasonably believe will not survive in the wild or for transport to a licensed wildlife rehabilitator. Similarly, sick birds may be euthanized during a morbidity incident for disease monitoring.

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 will facilitate planning and execution at regional and state levels, and coordination of surveillance data for risk assessment. It will also facilitate partnerships between public and private interests, including efforts by federal, state, and local governments as well as non-governmental organizations, universities, and other interest groups.[8] Current information on disease distribution and knowledge of the mixing of birds in migratory flyways has been used to develop a prioritized sampling approach based on the major North American flyways. Surveillance data from all of those areas would be incorporated into national risk assessments, preparedness and response planning to reduce the adverse impacts of a disease outbreak in wild birds, poultry, or humans.

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

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

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

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

Surveillance in Hunter-harvested Birds: Check stations for waterfowl hunting or other harvestable bird species provide an opportunity to sample dead birds to determine the presence of a disease, and supplement data collected during surveillance of live wild birds. Sampling of hunter-killed birds will focus on hunted species that are most likely to be exposed to a disease; have relatively direct migratory 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, game fowl, and poultry flocks reared in backyard facilities may prove to be valuable for early detection and used as for surveillance of diseases. Sentinel duck flocks may also be placed in wetland environments where they are potentially exposed to and infected with disease agents as they commingle with wild birds.

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

Under the disease sampling strategies listed above that could be implemented to detect or monitor avian diseases in the United States, WS' implementation of those sampling strategies would not adversely affect avian populations. 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).

4.1.1.2 Alternative 2 - Bird Damage Management by WS through Technical Assistance Only

Bird populations would not be directly impacted by WS from a program implementing technical assistance only. However, persons experiencing damage or threats from birds may implement methods based on WS' recommendations. Under a technical assistance only alternative, WS would recommend and demonstrate for use both non-lethal and lethal methods legally available for use to resolve bird damage. Methods and techniques recommended would be based on WS' Decision Model using information provided from the requestor or from a site visit. Requestors may implement WS' recommendations, implement other actions, or take no action. However,

those requesting assistance are likely those that would implement damage abatement methods in the absence of WS' recommendations.

Under a technical assistance only alternative, those persons experiencing threats or damage associated with birds could lethally take birds despite WS' lack of direct involvement in the management action. Therefore, under this alternative the number of birds lethally taken would likely be similar to the other alternatives since take could occur through the issuance of a depredation permit by the USFWS, the take of blackbirds could occur under the depredation order without the need for a permit, take of non-native bird species can occur without the need for a depredation permit from the USFWS, and take would continue to occur during the harvest season for those species. WS' participation in a management action would not be additive to an action that could occur in the absence of WS' participation.

With the oversight of the USFWS and the CT DEEP, it is unlikely that bird populations would be adversely impacted by implementation of this alternative. Under this alternative, WS would not be directly involved with damage management actions and therefore, direct operational assistance could be provided by other entities, such as the CT DEEP, the USFWS, private entities, and/or municipal authorities. If direct operational assistance is not available from WS or other entities, it is hypothetically possible that frustration caused by the inability to reduce damage and associated losses could lead to illegal take, which could lead to real but unknown effects on other wildlife populations. People have resorted to the illegal use of chemicals and methods to resolve wildlife damage issues (White et al. 1989, USFWS 2001, Food and Drug Administration 2003).

4.1.1.3 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. Birds could continue to be lethally taken by non-WS entities to resolve damage and/or threats occurring either through depredation permits issued by the USFWS, under the blackbird and cormorant depredation orders, during the regulated hunting seasons, or in the case of non-native species, take can 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 could still be taken by non-WS entities under this alternative, the potential effects on the populations of those bird species would be similar among all the alternatives for this issue.

4.1.2 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.

4.1.2.1 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 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. Minimization methods and 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-target exists when applying both non-lethal and lethal methods to manage damage or reduce threats to safety.

Non-lethal methods have the potential to cause adverse effects 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.

Other non-lethal methods available for use under this alternative include live traps, nets, and repellents. Live 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 will likely minimize the capture of non-targets. If traps and nets are attended to appropriately, any non-targets captured can be released on site unharmed.

Only those repellents registered with the EPA pursuant to the FIFRA would be recommended and used by WS under this alternative. Therefore, the use and recommendation of repellents would not have negative impacts on non-target species when used according to label requirements. Most repellents for birds, except for mesurol and Avitrol, are derived from natural ingredients that pose a very low risk to non-targets when exposed to or when ingested.

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, lethal traps, and DRC-1339.

The use of firearms is essentially selective for target species since animals are identified prior to application; therefore, no adverse impacts are anticipated from use of this method. A common concern regarding with the use of DRC-1339 is the potential non-target risks. All label requirements of DRC-1339 will 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 limited the likelihood that non-target species will consume treated bait since some bait types are not preferred by non-target species.

Once sites are baited, they are monitored daily to further observe for non-target feeding activity. If non-targets are observed feeding on bait, those sites are abandoned. 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 for treated bait to be present only when birds are conditioned to be present at the site and provides a higher likelihood that treated bait is consumed by the target species which makes it unavailable to non-targets. In addition, with 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. WS will retrieve all dead birds to the extent possible, following treatment with DRC-1339 to minimize secondary hazards associated with scavengers feeding on bird carcasses.

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 Connecticut is expected to be extremely low to non-existent. No non-targets have been taken by WS during prior bird damage management activities in the State. WS will monitor annually 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 will annually report to the USFWS and/or the CT DEEP 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. Minimization measures and SOPs to avoid T&E effects are described in Chapter 3 of this EA.

State Listed Species – State-listed species are separated into three categories: Connecticut Endangered; Connecticut Threatened; and Connecticut Species of Special Concern. State designations and their definitions are listed below:

- *Connecticut Endangered*: means any native species documented by biological research and inventory to be in danger of extirpation throughout all or a significant portion of its range within the state and to have no more than five occurrences in the state, and any species determined to be an "endangered species" pursuant to the federal Endangered Species Act.

- *Connecticut Threatened*: means any native species documented by biological research and inventory to be likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range within the state and to have no more than nine occurrences in the state, and any species determined to be a "threatened species" pursuant to the federal Endangered Species Act, except for such species determined to be endangered by the commissioner in accordance with section 26-306.

- *Connecticut Species of Special Concern*: means any native plant species or any native non-harvested wildlife species documented by scientific research and inventory to have a naturally restricted range or habitat in the state, to be at a low population level, to be in such high demand by man that its unregulated taking would be detrimental to the conservation of its populations or has been extirpated from the state.

All bird species, including state and federally listed species, could potentially be found at or near airports where those species represent strike hazards to aircraft. This strike threat also represents a direct threat to the individual birds themselves. Some state listed species may present a direct threat to human health and safety. 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 or other threats to human health and safety. 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 has and could continue to be requested to lethally remove individuals of those species, excluding federally listed species, on a limited basis when those individuals represent immediate threats of being struck by aircraft, immediate threats to human health and safety, continued predation of or competition with to other T&E species, when causing extensive damage to agricultural resources or property after implementation of non-lethal harassment and/or exclusion. The take of those species would only occur by WS when permitted by the USFWS and only at take levels allowed under those depredation permits. In addition, the take of those species would only occur when authorized by the CT DEEP pursuant to General Statutes of Connecticut, Chapter 490 Fisheries and Game, Section 26-69 Wildlife management practices which states "The commissioner may engage in wildlife management practices, including, but not limited to: (1) Managing the wildlife resources of the state to provide sustainable, healthy populations of diverse wildlife species, including endangered and threatened species, consistent with professional wildlife management principles."

Based on previous requests for assistance, WS does not anticipate taking more than two individuals annually of any of those species listed by the State, with the exception of broad-winged hawks, snowy egrets, great egrets, horned larks, American kestrels, and glossy ibis. Broad-winged hawks which have been fully analyzed in this EA due to multiple requests for assistance to respond to attacks on people, including children and the elderly, resulting in injury.

Snowy egrets, great egrets, horned larks, American kestrels, and glossy ibis have been analyzed as additional target species with take of up to 20 individuals due primarily to their presence and past take or harassment on airports. The permitting of the take by the USFWS and the CT DEEP 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.

The current list of State listed species as endangered or threatened by the State as determined by the CT DEEP was obtained and reviewed during the development of the EA (see Appendix C). Based on the review of species listed in the State, WS has determined that the proposed activities will not adversely affect those species currently listed by the State. The CT DEEP has concurred with WS' determination for State listed species (L. Saucier, CT DEEP, pers. comm. 2013).

Federally Listed Species - The current list of species designated as threatened and endangered in Connecticut as determined by the USFWS and the National Marine Fisheries Services was obtained and reviewed during the development of this EA. Appendix C contains the list of species currently listed in the State.

Because of the statewide scope and number of species and activities covered under this EA and due to an increasingly heavy workload, at the USFWS, New England Field Office (NEFO) of Ecological Services, WS will consult with and follow the procedures and guidelines provided by the NEFO to assist in determining whether a Section 7 consultation is needed on a project by project basis. These procedures are provided on the USFWS NEFO Endangered Species Consultation Project Review for Projects with Federal Involvement website as well as information on how to avoid or minimize adverse effects for specific projects. The website is located at http://www.fws.gov/newengland/EndangeredSpec-Consultation_Project_Review.htm.

For each bird damage management project, WS personnel will access the website and review the list for the state of Connecticut to determine if federally listed species are in the city or town where the project is to be conducted, and if so, could they be located at the project site during the period when the project will be conducted. If the proposed project occurs in a city or town with no known federally listed, proposed, or candidate species present, no further coordination with the USFWS is needed. A "No Species Present" letter stating "no species are known to occur in the project area" will be included with the project file. A copy of this letter is included as Appendix D.

If one or more federally listed, proposed, or candidate species occurs in the city or town where the project will be conducted, WS will determine whether these species are likely to occur within the proposed project area by comparing the habitat present within the proposed project action area with habitat that is suitable for the species. This will be done through a review the information provided in species profiles and fact sheets on the USFWS NEFO website, from the CT DEEP Endangered Species Program, or any other sources of information available to WS to determine types of habitat the species use. This will be used by WS personnel to determine whether the proposed project area has any potential for listed species habitat. If the project site is in appropriate habitat for federally listed species, additional investigation will be made.

If the CT DEEP Endangered Species Program does not identify any listed species for the proposed project and there is no potential habitat for any listed species within the project area, no further coordination with the USFWS NEFO is required and a "no species present" letter stating "no species are known to occur in the project area" will be entered into the project file.

If potential listed species habitat is present although the species has not been documented from that specific location or if federally listed species are known to occur at the project site, WS personnel will consult with the USFWS NEFO, and if necessary obtain the appropriate formal or informal Section 7 Consultation as required under the ESA.

4.1.2.2 Alternative 2 - Bird Damage Management by WS through Technical Assistance Only

Under a technical assistance alternative, WS would have no direct impact on non-target species, including T&E species. Methods recommended or provided through loaning of equipment could be employed by those requesting assistance. Recommendations would be based on WS' Decision Model using information provided by the person requesting assistance or through site visits. Recommendations would include methods or techniques to minimize non-target impacts associated with the methods being recommended or loaned. Methods recommended could include non-lethal and lethal methods as deemed appropriate by WS' Decision Model and as permitted by laws and regulations.

The potential impacts to non-targets under this alternative would be variable and based on several factors. If methods are employed, as recommended by WS and cooperating agencies, the potential impacts to non-targets are likely similar to the proposed action. If recommended methods and techniques are not followed or if other methods are employed that were not recommended, the potential risks to non-target species, including T&E species is likely higher compared to the proposed action.

The potential impacts of harassment and exclusion methods to non-target species would be similar to those described under the proposed action. Harassment and exclusion methods are easily obtainable and simple to employ. Since identification of targets occurs when employing shooting as a method, the potential impacts to non-target species are likely low under this alternative.

If requestors are provided technical assistance but do not implement any of the recommended actions, the potential impacts to non-targets would usually be lower compared to the proposed action. One of the possible exceptions to this would be if the recommendations were to protect T&E species or other non-target species. If those requesting assistance implement recommended methods appropriately and as instructed or demonstrated, the potential impacts to non-targets would be similar to the proposed action. Methods or techniques not implemented as recommended or used inappropriately would likely increase potential impacts to non-targets. Therefore, the potential impacts to non-targets, including T&E species would be variable under a technical assistance only alternative.

If non-lethal methods recommended by WS under this alternative were deemed ineffective by those requesting assistance, lethal methods could be employed by those experiencing damage. Those requesting assistance are those likely to use lethal methods since a damage threshold has been met for that individual requestor that has triggered seeking assistance to reduce damage. The potential impacts on non-targets by those experiencing damage would be highly variable. People may resort to other means of legal or illegal lethal control. This could result in less experienced persons implementing control methods and could lead to greater take of non-target wildlife than the proposed action. When those experiencing damage caused by wildlife reach a level where assistance does not adequately reduce damage or where no assistance is available, people have resorted to using chemical toxicants that are illegal for use on the intended target species that often results in loss of both target and non-target wildlife (White et al. 1989, USFWS 2001, Food and Drug Administration 2003). The use of illegal toxicants by those frustrated with

the lack of assistance or assistance that inadequately reduces damage to an acceptable level can often result in the indiscriminate take of wildlife species.
However, it would be expected that this alternative would have a greater chance of reducing damage than Alternative 3 since WS would be available to provide information and advice.

4.1.2.3 Alternative 3 – No Bird Damage Management Conducted by WS

Under this alternative, WS would not be directly involved with bird damage management activities. Therefore, no direct impacts to non-targets or T&E species would occur by WS under this alternative. Birds would continue to be taken by non-WS entities under depredation permits issued by the USFWS and the CT DEEP, 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, and blackbirds could still be taken under the depredation orders. 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 other federal, state, and private entities. Although some risks occur from those 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 negative impacts 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.

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

A common concern is the potential adverse effects that 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.

4.1.3.1 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, 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.

Under the proposed action, those methods discussed in Appendix B, would be integrated to resolve and prevent damage associated with birds. Those methods would be continually evaluated for effectiveness and if necessary, additional methods could be employed. Non-lethal and lethal methods could be used under the proposed action. 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, lethal traps, 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 CT DEEP.

WS' employees who conducted bird damage management activities are knowledgeable in the use of methods, wildlife species responsible for causing damage or threats, and WS' directives. When employing lethal methods, WS' employees considered risks to human safety when employing those methods based on location and method. Risks to human safety from the use of methods is likely greater in urban areas when compared to rural areas that are less densely populated. Consideration is also give to the location where damage management activities will be conducted based on property ownership. If locations where methods will 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 is likely 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.

The use of lethal and live-capture traps has also been identified as a potential issue. 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.

Lethal traps available for birds are typically modified snap traps or snap traps placed in wooden birdhouse style boxes. These types of traps are typically used to take woodpeckers causing damage to residential and non-residential buildings or other cavity nesting birds. Snap traps are traditional wooden mouse or rat traps. They are modified by adding ¼ inch hardware cloth to the catch or trigger mechanism and the hammer or swing arm, to increase the capture area. Both of these types of traps are hung on the exterior of the building receiving damage, and pose little risk of bodily harm to anyone but the individual placing the trap.

Live-capture traps available for birds are typically walk-in style traps, such as box/cage traps, nest traps or decoy traps where birds enter but are unable to exit. Other types of live traps include Bal-Chatri traps that utilize small monofilament nooses to ensnare the talons of raptors, pole traps, padded leg hold traps, Dho-gaza traps, and mist nets. Human safety concerns associated with live traps used to capture birds require direct contact to cause bodily harm.

Other live-capture devices, such as net guns, net launchers, and bow 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 which limits the exposure of the public to misuse of the method.

Safety issues 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 will be conducted before firearms are deemed appropriate to alleviate or reduce damage and threats to human safety when conducting activities. WS will work closely with cooperators requesting assistance to ensure all safety issues are considered before the use of firearms is 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 administered chemical methods will be properly trained in the use of those methods. Training and adherence to agency directives will ensure the safety of

employees applying chemical methods. Birds euthanized by WS or taken using chemical methods will be disposed of in accordance with WS Directive 2.515. All euthanasia will occur in the absence of the public to further minimize risks. Minimization measures and 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 as discussed under Alternative 2. 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 Connecticut 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 with 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 Connecticut is DRC-1339 (3-chloro-p-toluidine hydrochloride) that could be used for bird damage management. DRC-1339 is currently registered with the EPA to manage damage associated with several bird species and can be formulated on a variety of bait types depending on the label. Technical DRC-1339 (powder) must be mixed with water and in some cases, a binding agent (required by the label for specific bait types). Once the technical DRC-1339, water, and binding agent, if required, are mixed, the liquid is poured over the bait and mixed until the liquid is absorbed and evenly distributed. The treated bait is then allowed to air dry. 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. Before application at bait locations, treated bait is mixed with untreated bait at ratios required by the product label to minimize non-target hazards and to avoid bait aversion by target species.

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 pre-baiting and an acclimation period), on non-target use of the area (areas with non-target activity are not used or abandon), 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 are determined, treated baits are placed in feedings stations or are 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 are monitored for non-target activity and to ensure the safety of the public. After each baiting session, all uneaten bait is retrieved. Through pre-baiting, target birds can be acclimated to feed at certain locations at certain periods of time. By acclimating birds 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 for treated bait to be placed at a location only when target birds are conditioned to be present at the site and provides a higher likelihood that treated bait is 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 has been consumed by target species or is removed by WS, then treated bait is no longer 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 occurred from June until the end of February the following calendar year with no daily take limit and no possession limit (CT DEEP 2010). Under the proposed action, baiting using DRC-1339 to reduce crow damage could occur in the State during the period of time when crows can be harvested. Although baiting could occur in rural areas during those periods of time, 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.

In summary, nearly all of the DRC-1339 ingested by sensitive species is metabolized or excreted quickly, normally within a few hours. Residues DRC-1339 ingested by birds appears 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.

The recommendation by WS that birds be harvested during the regulated hunting season which is established by the CT DEEP 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 CT DEEP for the regulated hunting season will further minimize risks associated with hunting. Although hunting accidents do occur, the recommendation of allowing hunting to reduce localized populations of birds will not increase those risks. The risks are the same for Alternative 2.

No adverse effects to human safety have occurred from WS' use of methods to alleviate bird damage in the State from FY 2004 through FY 2011. The risks to human safety from the use of non-lethal and lethal methods, when used appropriately and by trained personnel, is considered low.

4.1.3.2 Alternative 2 - Bird Damage Management by WS through Technical Assistance Only

Under this alternative, WS would be restricted to making recommendations of methods and the demonstration of methods only to resolve damage. WS would only provide technical assistance to those requesting assistance with bird damage and threats. Although hazards to human safety from non-lethal methods exist, those methods are generally regarded as safe when used by trained individuals who are experienced in their use. Although some risk of fire and bodily harm exists from the use of pyrotechnics and propane cannons, when used appropriately and in consideration of those risks, they can be used with a high degree of safety.

Under a technical assistance only alternative, the use of DRC-1339 and mesurol would not be available to the general public.

The use of chemical methods, including repellents that are considered non-lethal would also be available under this alternative. There are few chemical repellents registered for use to manage birds in the State. Most repellents require ingestion of the chemical to achieve the desired effects on target species. The active ingredients of repellents that are currently registered for use to disperse birds include methyl anthranilate and polybutene. Methyl anthranilate (grape derivative) and anthraquinone (plant extract) are naturally occurring chemicals. Repellents, when used according to label directions, are generally regarded as safe especially when the ingredients are considered naturally occurring. Some risk of exposure to the chemical occurs to the applicator and to others from the potential for drift as the product is applied. Some repellents also have restrictions on whether application can occur on edible plants with some restricting harvest for a designated period after application. All restriction on harvest and required personal protective equipment would be included on the label and if followed, would minimize risks to human safety associated with the use of those products.

The recommendation of shooting with firearms either as a method of direct lethal take could occur under this alternative. Safety issues due arise related to misusing firearms and the potential human hazards associated with firearms use when employed to reduce damage and threats. When used appropriately and with consideration for human safety, risks associated with firearms are

minimal. If firearms are employed inappropriately or without regard to human safety, serious injuries could occur. Under this alternative, recommendations of the use of firearms by WS would include human safety considerations. Since the use of firearms to alleviate bird damage would be available under any of the alternatives and the use of firearms by those persons experiencing bird damage could occur whether WS was consulted or contacted, the risks to human safety from the use of firearms would be similar among all the alternatives. However, risks could be greater is untrained or people not familiar with firearms were to conduct their own operational bird damage management with firearms.

If non-chemical methods are employed according to recommendations and as demonstrated by WS, the potential risks to human safety would be similar to the proposed action. If methods are employed without guidance from WS or applied inappropriately, the risks to human safety could increase. The extent of the increased risk would be unknown and variable. Non-chemical methods inherently pose minimal risks to human safety given the design and the extent of the use of those methods.

The cooperator requesting assistance is also made aware of threats to human safety associated with the use of those methods. Risks to human safety from activities and methods recommended under this alternative would be similar to the other alternatives since the same methods would be available. If misused or applied inappropriately, any of the methods available to alleviate bird damage could threaten human safety. However, when used appropriately, methods available to alleviate damage would not threaten human safety.

4.1.3.3 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 in the State, 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. The direct burden of implementing permitted methods would be placed on those experiencing damage.

Similar to the technical assistance only alternative, DRC-1339 and mesurol 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 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.

4.1.4 Issue 4 - Effects on the Aesthetic Values of Birds

Another concern often raised is the potential impact the proposed action will have on the aesthetic value that people often regard for birds. The effects of the alternatives on this issue are analyzed below by alternative.

4.1.4.1 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 will 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 will 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 will still 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, 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 2006 through FY 2011 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. Although birds removed by WS are no longer present for viewing or enjoying, those birds would likely be taken by the property owner or manager if WS was not involved in the action since take by the property owner or manager could occur under a depredation permit, under depredation orders for blackbirds and cormorants, during the regulated hunting seasons, or if the birds are non-native, take could occur without the need for a permit. 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.

4.1.4.2 Alternative 2 - Bird Damage Management by WS through Technical Assistance Only

If those persons seeking assistance from WS were those persons likely to conduct bird damage management activities in the absence of WS' involvement, then technical assistance provided by WS would not adversely affect the aesthetic value of birds similar to Alternative 1. Birds could be lethally taken under this alternative by those entities experiencing bird damage or threats which would result in localized reductions in the presence of birds at the location where damage was occurring. The presence of birds where damage was occurring would be reduced where damage management activities are conducted under any of the alternatives. Even the recommendation of non-lethal methods is likely to result in the dispersal of birds from the area if those non-lethal methods recommended by WS are employed by those receiving technical

assistance. Therefore, technical assistance provided by WS would not prevent the aesthetic enjoyment of birds since any activities conducted to alleviate bird damage could occur in the absence of WS' participation in the action, either directly or indirectly.

4.1.4.3 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 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. Birds could continue to be dispersed and lethally taken under this alternative by non-WS entities. Lethal take would continue to occur when permitted by the USFWS and the CT DEEP through the issuance of depredation permits, take could occur during the regulated harvest season, take could also continue to occur pursuant to the blackbird and cormorant depredation orders, and in the case of non-native species, take could occur any time without the need for a depredation permit.

Since birds will 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 CT DEEP with management authority over birds would continue to adjust all take levels based on population objectives for those bird species in the State. Therefore, the number of birds lethally taken annually through hunting and under the depredation orders are regulated and adjusted by the USFWS and the CT DEEP.

Those experiencing damage or threats would continue to use those methods they feel appropriate to resolve bird damage or threats, including lethal take. WS' involvement in bird damage management is therefore, not additive to the birds already taken. The impacts to the aesthetic value of birds would be similar to the other alternatives.

4.1.5 Issue 5 - Humaneness and Animal Welfare Concerns of Methods

A common issue often raised is concerns 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.

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

Under the proposed action, WS would integrate methods using WS' Decision Model as part of technical assistance and direct operational assistance. Methods available under the proposed action could include non-lethal and lethal methods integrated into direct operational assistance conducted by WS. Under this alternative, non-lethal methods would be used by WS which are generally regarded as humane. Non-lethal methods would include resource management methods (*e.g.*, crop selection, limited habitat modification, modification of human behavior), exclusion devices, frightening devices, reproductive inhibitors, cage traps, nets, and repellents.

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

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

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

Therefore, the goal is to effectively address requests for assistance using methods in the most humane way possible that minimizes the stress and pain to the animal. Overall, the use of resource management methods, harassment methods, and exclusion devices are regarded as humane when used appropriately. Although some concern arises from the use of live-capture methods, the stress of animals is likely temporary.

Although some issues of humaneness could occur from the use of cage traps, nets, and repellents, those methods, when used appropriately and by trained personnel, would not result in the inhumane treatment of wildlife. Concerns from the use of those non-lethal methods are from injuries to animals while restrained and from the stress of the animal while being restrained or during the application of the method. 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.

If birds are to be live-captured, WS' personnel would be present on-site during capture events or methods would be checked frequently to ensure birds captured are addressed in a timely manner to prevent injury. Although stress could occur from being restrained, timely attention to live-captured wildlife would alleviate suffering. Stress would likely be temporary.

Under the proposed action, lethal methods could also be employed to resolve requests for assistance to resolve or prevent bird damage and threats. Lethal methods would include shooting, DRC-1339, and euthanasia after birds are live-captured. WS' use of euthanasia methods under the proposed action would follow those required by WS' directives (WS Directive 2.430) and recommended by the AVMA for use on free-ranging wildlife under field conditions (AVMA 2007).

The euthanasia methods being considered for use under the proposed action for live-captured birds are injectable euthanasia drugs, cervical dislocation and carbon dioxide. The AVMA guideline on euthanasia lists euthanasia drugs, cervical dislocation and carbon dioxide as acceptable methods of euthanasia for free-ranging birds which can lead to a humane death (AVMA 2007). The use of euthanasia drugs, cervical dislocation or carbon dioxide for euthanasia would occur after the animal has been live-captured and away from public view. Although the AVMA guideline also lists 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 2007). WS' personnel that employ firearms to address bird damage or threats to human safety will 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 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 approve the LD_{50} for starlings appeared normal for 20 to 30 hours, but water consumption doubled after 4 to 8 hours and decreased thereafter. Food consumption remained fairly constant until about 4 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. In non-sensitive birds and mammals, central nervous system depression and the attendant cardiac or pulmonary arrest is the cause of death (Felsenstein et al. 1974). DRC-1339 is the only lethal method that would not be available to other entities under the other alternatives.

The chemical repellent under the trade name Avitrol acts as a dispersing agent when birds ingest treated particles which causes them to become hyperactive (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. None were observed. Conclusions of the study were that the chemical met the criteria for a humane pesticide.

Research and development by WS has improved the selectivity and humaneness of management techniques. 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 methods are used in situations where non-lethal damage management methods are not practical or effective. Personnel from WS are experienced and professional in their use of management methods. Consequently, management methods are implemented in the most humane manner possible under the constraints of current technology. Those methods discussed in Appendix B to alleviate bird damage and/or threats in the State, except for DRC-1339 and mesurol, could be used under any of the alternatives by those experiencing damage regardless of WS' direct involvement. Therefore, the issue of humanness associated with methods would be similar across any of the alternatives since those methods could be employed. Those persons who view a particular method as humane or inhumane would likely continue to view those methods as humane or inhumane under any of the alternatives. Minimization measures and SOPs that would

be incorporated into WS' activities to ensure methods are used by WS as humanely as possible are listed in Chapter 3.

4.1.5.2 Alternative 2 - Bird Damage Management by WS through Technical Assistance Only

The issues of humaneness of methods under this alternative are likely to be perceived to be similar to humaneness issues discussed under the proposed action. This perceived similarity is derived from WS' recommendation of methods that some consider inhumane. WS would not directly be involved with damage management activities under this alternative. However, the recommendation of the use of methods would likely result in the requester employing those methods. Therefore, by recommending methods and thus a requester employing those methods, the issue of humaneness would be similar to the proposed action.

WS would instruct and demonstrate the proper use and placement of methodologies to increase effectiveness in capturing target bird species and to ensure methods are used in such a way as to minimize pain and suffering. However, the efficacy of methods employed by a cooperator would be based on the skill and knowledge of the requestor in resolving the threat to safety or damage situation despite WS' demonstration. Therefore, a lack of understanding of the behavior of birds or improperly identifying the damage caused by birds along with inadequate knowledge and skill in using methodologies to resolve the damage or threat could lead to incidents with a greater probability of being perceived as inhumane. In those situations, the pain and suffering are likely to be regarded as greater than those discussed in the proposed action.

4.1.5.3 Alternative 3 – No Bird Damage Management Conducted by WS

Under this alternative, WS would have no involvement in any aspect of bird damage management in Connecticut. Those 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 general public since methods are often labeled as inhumane by segments of society no matter the entity employing those methods.

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 general public to use to resolve damage and threats caused by birds.

4.1.6 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 CT DEEP. 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 CT DEEP in published reports.

4.1.6.1 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 birds was included as part of the known mortality of those species and compared to the estimated population, the impact on those species' populations was below the level of removal required to lower population levels.

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

4.1.6.2 Alternative 2 - Bird Damage Management by WS through Technical Assistance Only

WS would have no impact on regulated hunting since WS would not lethally remove birds under this alternative. However, resource/property owners may remove birds under depredation permits, depredation orders, and the regulated hunting seasons resulting in impacts similar to the proposed action and the other alternatives. The recommendation of non-lethal methods could disperse or exclude birds from areas under this alternative which could limit the ability of those interested to harvest those birds in the damage management area. However, the recommendation of harassment techniques to disperse birds could increase opportunities to harvest birds by dispersal those birds from areas where hunting is prohibited or restricted. Therefore, the populations of those birds species would be unaffected by WS under this alternative.

4.1.6.3 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 CT DEEP 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.

WS will continue to coordinate bird damage management activities and will report all take of birds to the USFWS and CT DEEP annually. WS will also annually monitor program activities to ensure those activities are within the scope analyzed in this EA.

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

Evaluation of activities relative to target species indicated that program activities will likely have no

cumulative adverse effects on bird populations when targeting those species responsible for damage. WS' actions would be occurring simultaneously, over time, with other natural processes and human generated changes that are currently taking place. These activities include, but are not limited to:

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

All those factors play a role in the dynamics of bird 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. The 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 uses the Decision Model to evaluate damage occurring, including other affected elements and the dynamics of the damaging species; to determine 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.

With management authority over bird population, the USFWS and the CT DEEP can adjust take levels, including the take of WS, to ensure population objectives for birds are achieved. Consultation and reporting of take by WS will ensure the USFWS and the CT DEEP considers any activities conducted by WS.

WS' take of birds in Connecticut from FY 2006 through FY 2012 was of a low magnitude when compared to the total known take and the populations of those species. The USFWS and the CT DEEP considers all known take when determining population objectives for birds and can adjust the number of birds that can be taken during the regulated hunting season and the number of birds taken for damage management purposes to achieve the population objectives. Any take by WS will occur at the discretion of the USFWS and the CT DEEP. Any bird population declines or increases will be the collective objective for bird populations established by the USFWS and the CT DEEP through the regulation of take. Therefore, the cumulative take of birds annually or over time by WS will occur at the desire of the USFWS and the CT DEEP as part of management objectives for birds.
No cumulative adverse impacts on target and non-target wildlife are expected from WS' bird damage management actions based on the following considerations:

1. Historical outcomes of WS' damage management activities on wildlife

Bird damage management activities are conducted by WS only at the request of a cooperator to reduce damage that is occurring or prevent damage from occurring and only after methods to be used are agreed upon by all parties involved. WS annually monitors activities to ensure any potential impacts are identified and addressed. WS works closely with state and federal resource agencies to ensure damage management activities are not adversely impacting bird populations and that WS' activities are considered as part of management goals established by those agencies. Historically, WS' activities to manage birds in Connecticut have not reached a magnitude that would cause adverse impacts to bird population in the State.

2. SOP and strategies built into the WS program

SOPs and minimization measures are designed to reduce the potential negative effects of WS' actions on birds, 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 programs are defined through SOPs and minimization measures, and implementation is insured through monitoring, in accordance with the WS' Decision Model (Slate et al. 1992).

3. Current status of potentially affected wildlife species

Natural and human-induced mortality patterns for birds are expected to remain essentially unchanged in Connecticut. This is true of elements outside WS' programs and the programs themselves. As a result, no cumulative adverse effects are expected from repetitive programs over time in the fairly static set of conditions currently affecting wildlife in Connecticut.

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

Potential effects on non-target species from conducting bird damage management arise from the use of non-lethal and lethal methods to alleviate or prevent those damages. The use of non-lethal methods during activities to reduce or prevent damage caused by birds has the potential to exclude, disperse, or capture non-target wildlife. However, the effects of non-lethal methods are often temporary and often do not involve the take (killing) of non-target wildlife species. When using exclusion devices and/or repellents, both target and non-target wildlife can be prevented from accessing the resource being damaged. Since exclusion does not involve lethal take, cumulative impacts on non-target species from the use of exclusionary methods will not occur but would likely disperse those individuals to other areas. Exclusionary methods are often expensive and require constant maintenance to ensure effectiveness. Therefore, the use of exclusionary devices will be somewhat limited to small, high-value areas and not used to the extent that non-targets are excluded from large areas that would cumulatively impact populations from the inability to access a resource, such as potential food sources or fawning sites. The use of visual and auditory harassment and dispersion methods are generally temporary with non-target species returning after the cessation of those activities. Dispersal and harassment do not involve the take (killing) of non-target species and similar to exclusionary methods are not used to the extent or at a constant level that would prevent non-targets from accessing critical resources that would threaten survival of a population.

The use of lethal methods or those methods used to live-capture target species followed by euthanasia also have the potential to impact non-target wildlife through the take (killing) or capture of non-target species. Capture methods used are often methods that are set to confine or restrain target wildlife after being triggered by a target individual. Capture methods are employed in such a manner as to minimize the threat to non-target species by placement in those areas frequently used by target wildlife, using baits or lures that are as species specific as possible, and modification of individual methods to exclude non-targets from capture. Most methods described in Appendix B are methods that are employed to confine or restrain wildlife that are subsequently euthanized using humane methods since relocation is currently not considered. With all live-capture devices, non-target wildlife captured can be released on site if determined to be able to survive following release. On rare occasions, non-targets live captured in live-capture devices may be injured and unable to be released or may be killed. Injury or death of non-targets may result from deployement of the trap, trying to escape, through exposure to unexpected inclement weather such as heavy rain, or the by predators that enter or reach into the trap. Minimization measures and SOPs are intended to ensure take of non-target wildlife is minimal during the use of methods to capture target wildlife.

The use of firearms and euthanasia methods are essentially selective for target species since identification of an individual is made prior to the application of the method. Euthanasia methods are applied through direct application to target wildlife. Therefore, the use of those methods will not impact non-target species.

Chemical methods available for use under the proposed action are DRC-1339 and repellents that are described in Appendix B. All chemical methods are employed using baits that are highly attractive to target species and used in areas where exposure to non-targets are minimal. The use of DRC-1339 requires pre-baiting and monitoring of potential bait sites for non-target activity. All chemicals will be used according to product label which ensure that proper use will minimize non-target threats. WS' adherence to Directives, SOPs, and mitigation measures governing the use of chemicals also ensures non-target hazards are minimal.

All chemical methods will be tracked and recorded to ensure proper accounting of used and unused chemicals occurs. All chemicals will be stored and transported according with WS' Directives and relevant federal, state, and local regulations. The amount of chemicals used or stored by WS will be minimal to ensure human safety. Based on this information, WS' use of chemical methods, as part of the proposed action, will not have cumulative impacts on non-targets.

All label requirements of DRC-1339 will 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. Once sites are baited, sites are monitored daily to further observe for non-target feeding activity. If birds are observed feeding on bait, those sites are abandoned. WS will retrieve all dead birds to the extent possible, following treatment with DRC-1339 to minimize secondary hazards associated with scavengers feeding on bird carcasses.

Repellents may also be used or recommended by the WS program in Connecticut to manage bird damage. The active ingredient in numerous commercial repellents is methyl anthranilate which has been categorized by the EPA as "*generally recognized as safe*". Characteristics of these chemicals and potential use patterns indicate that no significant cumulative impacts related to environmental fate are expected from their use in WS' programs in Connecticut when used according to label requirements.

The methods described in Appendix B all have a high level of selectivity and can be employed using SOPs and minimization measures to ensure minimal impacts to non-targets species. No non-targets were taken by WS during bird damage management activities from FY 2004 through FY 2011. 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 impact non-target species. WS' has reviewed the T&E species listed by the CT DEEP, the USFWS, and the National Marine Fisheries Services and has determined that bird damage management activities proposed by WS will not likely adversely affect T&E species. Cumulative impacts will be minimal on non-targets from any of the alternatives discussed**.**

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

All non-chemical methods described in Appendix B are used within a limited time frame, are not residual, and do not possess properties capable of inducing cumulative adverse impacts on human health and safety. All non-chemical methods are used after careful consideration of the safety of

those employing methods and to the public. All capture methods are employed where human activity is minimal to ensure the safety of the public. Capture methods also require direct contact to trigger ensuring that those methods, when left undisturbed will have no effect on human safety. All methods are agreed upon by the requesting entities which are made aware of the safety issues of those methods when entering into a MOU, cooperative service agreement, or other comparable document between WS and the cooperating entity. SOPs and minimization measures also ensure the safety of the public from those methods used to capture or take wildlife. Firearms used to alleviate or prevent damage, though hazards do exist, are employed to ensure the safety of employees and the public.

Personnel employing non-chemical methods will continue to be trained to be proficient in the use of those methods to ensure safety of the applicator and to the public. Based on the use patterns of non-chemical methods, those methods will not cumulatively impact human safety.

Repellents have been available for use to disperse birds from areas of application are available. All repellents must be registered with the EPA according to the FIFRA. Many of the repellents currently available for use have active ingredients that are naturally occurring and are generally regarded as safe. Although some hazards exist from the use of repellents, hazards occur primarily to the handler and applicator. When repellents are applied according to label requirements, no cumulative adverse effects to human safety are expected.

Bird damage management programs which include the use of pesticides as a lethal population management component may have the greatest potential for cumulative impacts on the environment as such impacts relate to the deposit of chemical residues in the physical environment with potential for environmental toxicosis.

DRC-1339 may be used by WS or recommended by WS for use to manage damage or threats associated with birds in Connecticut. DRC-1339 has been evaluated for possible residual effects which might occur from buildup of the chemical in soil, water, or other environmental sites. DRC-1339 is formulated on baits and placed in areas only after pre-baiting has occurred and in only those areas where non-targets are not present or would not be exposed to treated baits. Baits treated with DRC-1339 are placed on platforms or other hard surfaces where they seldom come into contact with soil, surface water, and/or ground water. All uneaten bait is recovered and disposed of according to EPA label requirements.

DRC-1339 exhibits a low persistence in soil or water, and bioaccumulation of the chemical is unlikely. Additionally, the relatively small quantity of DRC-1339 that could potentially be used in bird damage management programs in Connecticut, the chemical's instability which results in degradation of the product, and application protocols used in WS' programs further reduces the likelihood of any environmental accumulation. From FY 2006 through FY 2011, WS has used 1,338 grams of DRC-1339 during bird damage management activities. The use of DRC-1339 under the proposed action and in other bird damage management activities is not expected to increase to a level that adverse effects would occur from the cumulative use of the chemical. Based on potential use patterns, the chemical and physical characteristics of DRC-1339, and factors related to the environmental fate, no cumulative impacts are expected from the lethal chemical components used or recommended by the WS program in Connecticut.

WS has received no reports or documented any adverse effects to human safety from WS' bird damage management activities conducted from FY 2006 through FY 2011. No cumulative adverse effects from the use of those methods discussed in Appendix B are expected given the use patterns of those methods for resolving bird damage in the State.

4.2.4 Issue 4 - Effects on the Aesthetic Values of Birds

The activities of WS would result in the removal of birds from those areas where damage or threats were occurring. Therefore, the aesthetic value of birds in those areas where damage management activities were being conducted would be reduced. However, for some people, the aesthetic value of a more natural environment would be gained by reducing bird densities, including the return of native plant species that may be suppressed or killed by accumulations of fecal dropping by high bird densities found under roost areas.

Some people experience a decrease in aesthetic enjoyment of wildlife because they feel that overabundant species are objectionable and interfere with their enjoyment of wildlife in general. Continued increases in numbers of individuals or the continued presence of birds may lead to further degradation of some people's enjoyment of any wildlife or the natural environment. The actions of WS could positively affect the aesthetic enjoyment of wildlife for those people that are being adversely affected by the target species identified in this EA.

Bird population objectives are established and enforced by the USFWS and the CT DEEP through the regulating of take during the statewide hunting season after consideration of other known mortality factors. Therefore, WS has no direct impact on the status of the bird population since all take by WS occurs at the discretion of the USFWS and the CT DEEP. Since those persons seeking assistance could remove birds from areas where damage is occurring without a permit from the USFWS or the CT DEEP, WS' involvement would have no effect of the aesthetic value of birds in the area where damage was occurring. 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.

4.2.5 Issue 5 - Humaneness and Animal Welfare Concerns of Methods

WS continues to seek new methods and ways to improve current technology to improve the humaneness of methods used to manage damage caused by wildlife. Cooperation with individuals and organizations involved in animal welfare continues to be an agency priority for the purpose of evaluating strategies and defining research aimed at developing humane methods.

All methods not requiring direct supervision during employment (*e.g.*, live traps) will be checked and monitored to ensure any wildlife confined or restrained are addressed in a timely manner to minimize distress of the animal. All euthanasia methods used for live-captured birds will be applied according to AVMA guidelines for free-ranging wildlife. Shooting will occur in limited situations and personnel will be trained in the proper use of firearms to minimize pain and suffering of birds taken by this method.

WS employs methods as humanely as possible by applying measures to minimize pain and that allow wildlife captured to be addressed in a timely manner to minimize distress. Through the establishment of minimization measures and SOPs that guide WS in the use of methods to address damage and threats associated with birds in the State, the cumulative impacts on the issue of method humaneness are minimal. All methods will be evaluated annually to ensure measures and SOPs are adequate to ensure those methods continue to be used to minimize suffering and that wildlife captured are addressed in a timely manner to minimize distress.

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

As discussed in this EA, the magnitude of WS' bird take for damage management purposes from FY 2006 through FY 2011 was low when compared to the total take of birds and when compared to the estimated statewide population. Since all take of birds is regulated by the USFWS and the CT DEEP, the take of birds by WS that would occur annually and cumulatively would occur pursuant to bird population objectives established in the State. WS' take of birds (combined take) annually to alleviate damage would be a minor component to the known take that occurs annually during the harvest seasons.

With oversight of bird take, the USFWS and the CT DEEP maintains the ability to regulate take by WS to meet management objectives for birds in the State. Therefore, the cumulative take of birds is considered as part of the USFWS and the CT DEEP objectives for bird populations in the State.

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APPENDIX A

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APPENDIX B

BIRD DAMAGE MANAGEMENT METHODS AVAILABLE FOR USE OR RECOMMENDATION BY THE CONNECTICUT WS' PROGRAM

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 eye spot 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 a lowering of the 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, every other day, or as appropriate, 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.

Foot-hold traps are used by WS for preventative and corrective damage management. Trapping with foot-hold traps can be effective in areas where a small resident crow population is present (Johnson 1994). No. 0 or 1 foot-hold traps with padded jaws would be used to trap individual birds in areas habitually used by crows. Traps would be monitored a minimum of twice each day and trapped birds euthanized by methods approved by the AVMA or a veterinarian.

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 in to 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.

Nest 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 for home and business owners. 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 addling/destruction is a method of suppressing reproduction in local nuisance bird populations by destroying egg embryos prior to hatching. Egg addling is conducted by vigorously shaking an egg numerous times which causes detachment of the embryo from the egg sac. Egg destruction can be accomplished in several different ways, but the most commonly used methods are manually gathering eggs and breaking them, or by oiling or spraying the eggs with a liquid which covers the entire egg and prevents the egg from obtaining oxygen (see *Egg oiling* below). Although WS does not commonly use egg addling or destruction, it is a valuable damage management tool and has proven effective in some applications.

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

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[9]), nontoxic to rats in an inhalation study (LC_{50} > 2.8 mg/L[10]), 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. Also, 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)

[9] 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.

[10] 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.

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, birds develop post-ingestional malaise (Mason 1989) and crows develop an aversion to consuming similar looking eggs (Dimmick and Nicolaus 1990). Repeated exposures may be necessary to develop and maintain aversion to threatened or endangered species eggs 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 endangered or threatened species nesting areas. Treated eggs are not placed in locations where threatened or endangered species 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 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 in USDA (1997) 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 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.

Canada geese have been successfully vasectomized to prevent production of young; this method is only effective if the female does not form a bond with a different male. In addition, vasectomies can only prevent the production of the mated pair. The ability to identify breeding pairs for isolation and to capture a male bird for vasectomizing becomes increasingly difficult as the number of birds increase (Converse and Kennelly 1994). Keefe (1996) estimated mechanical sterilization of a Canada goose to cost over $100 per bird.

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 Canada geese and 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 Canada geese and 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 Canada Geese, 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% ($P < 0.001$). The high degree of variability among Canada Geese in their movement patterns, nesting and habitat use complicates use of this product (Vercauteren and Marks 2004). The variability in goose behavior can make it difficult to get the required doses to the geese (see below). Under current label guidelines, the cost for nicarbazin (Ovocontrol®) applications exceeds the cost of other control methods (Cooper and Keefe 1997) until the goose population reaches a critical threshold of approximately > 80 birds (Caudell and Shwiff 2006).

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. Shooting can be relatively expensive because of the staff hours sometimes required. 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 Connecticut Wildlife Resources Commission 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 Connecticut Department of Agriculture and Consumer Services, Pesticide Management Division). WS' personnel that use restricted-use chemical methods are certified as pesticide applicators by the State of Connecticut and are required to adhere to all certification requirements set forth in FIFRA and Connecticut 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 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 1972) and low toxicity to most mammals, sparrows, and finches (Schafer and Cunningham 1966, Apostolou 1969, Schafer 1972, Schafer 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, quails (*Coturnix coturnix*), chickens and ducks (*Anas* spp.) at ≥5.6 mg/kg (DeCino et al. 1966). In cage trials, Cummings et al. (1992) found that 2% DRC-1339-treated rice did not kill savannah sparrows (*Passerculus sandwichensis*). Gallinaceous birds and waterfowl may be more resistant to DRC-1339 than blackbirds, and their large size may reduce the chances of ingesting a lethal dose (DeCino et al. 1966). Avian reproduction does not appear to be affected from ingestion of DRC-1339 treated baits until levels are ingested where toxicity is expressed (USDA 2001).

There have been concerns expressed about the study designs used to derived 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).

[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.

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 which died from DRC-1339 were fed to raptors and scavenger mammals for 30 to 200 days with no symptoms of secondary poisoning observed (Cunningham et al. 1979). This can be attributed to relatively low toxicity to species that might scavenge on blackbirds 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 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). Studies using the American kestrel as a surrogate species show that secondary hazards to raptors are small, and these birds are not put at risk by DRC-1339 baiting. 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. WS' programmatic FEIS contains a thorough risk assessment of DRC-1339 and the reader is referred to that source for a more complete discussion. That risk assessment concluded that no adverse effects are expected from use of DRC-1339.

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.

DRC-1339 is typically very unstable in the environment and degrades quickly when exposed to sunlight, heat, and ultraviolet radiation. The half-life of DRC-1339 in biologically active soil was estimated at 25 hours with the identified metabolites having a low toxicity (EPA 1995). DRC-1339 is also highly soluble in water, does not hydrolyze, and photodegrades quickly in water with a half-life estimated at 6.3 hours in summer, 9.2 hours in spring sunlight, and 41 hours during winter (EPA 1995). DRC-1339 binds tightly with soil and is considered to have low mobility (EPA 1995). Given the best environmental fate information available and the unlikelihood of a non-target locating enough treated bait(s) sufficient to produce lethal effects, the risks to non-targets from crows caching treated bait would be low. When baiting, treated baits are mixed with untreated bait to minimize non-target hazards directly at the bait site and to minimize the likelihood of target species developing bait aversion. Since treated bait is diluted, often times up to 1 treated bait for every 25 untreated baits, the likelihood of a crow selecting treated bait and then caching the bait is further reduced.

DRC-1339 has several EPA Registration Labels (56228-10, 56228-28, and 56228-30) depending on the application or species involved in the bird damage management project. Connecticut WS used or supervised the use of a total of 154.85 grams of DRC-1339 from FY 2004 through FY 2009.

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 bird begins 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 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 1991). However, a laboratory study by Schafer 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 1981, Holler and Shafer 1982).

APPENDIX C

Connecticut List of Federally and State Listed Endangered, Threatened & Special Concern Species

State	Federal	Common Name	Scientific Name
Mammals			
SC	E	Gray wolf*	*Canis lupus*
E		Least shrew	*Cryptotis parva*
SC		Silver-haired bat	*Lasionycteris noctivagans*
SC		Red bat	*Lasiurus borealis*
SC		Hoary bat	*Lasiurus cinereus*
SC		Eastern small-footed bat*	*Myotis leibii*
E		Indiana bat+	*Myotis sodalis*
SC		Eastern woodrat*	*Neotoma magister*
SC		Harbor porpoise	*Phocoena phocoena*
SC	E	Eastern cougar*	*Puma concolor couguar*
SC		Southern bog lemming	*Synaptomys cooperi*
	E	Finback whale	*Balaenoptera physalus*
	E	Northern Atlantic right whale	*Eubalaena glacialis*
Birds			
E		Sharp-shinned hawk	*Accipiter striatus*
SC		Northern saw-whet owl	*Aegolius acadicus*
SC		Saltmarsh sharp-tailed sparrow	*Ammodramus caudacutus*
SC		Henslow's sparrow*	*Ammodramus henslowii*
T		Seaside sparrow	*Ammodramus maritimus*
E		Grasshopper sparrow	*Ammodramus savannarum*
T		Blue-winged teal (nesting population only)	*Anas discors*
T		Great egret	*Ardea alba*
T		Short-eared owl (wintering populations)	*Asio flammeus*

State	Federal	Common Name	Scientific Name
E		Long-eared owl	*Asio otus*
E		Upland sandpiper	*Bartramia longicauda*
E		American bittern	*Botaurus lentiginosus*
SC		Broad-winged hawk	*Buteo platypterus*
SC		Whip-poor-will	*Caprimulgus vociferus*
T	T	Piping plover	*Charadrius melodus*
E		Common nighthawk	*Chordeiles minor*
E		Northern harrier	*Circus cyaneus*
E		Sedge wren	*Cistothorus platensis*
SC		Bobolink	*Dolichonyx oryzivorus*
SC		Little blue heron	*Egretta caerulea*
T		Snowy egret	*Egretta thula*
SC		Alder flycatcher	*Empidonax alnorum*
E		Horned lark	*Eremophila alpestris*
T		Peregrine falcon	*Falco peregrinus*
T		American kestrel	*Falco sparverius*
E		Common moorhen	*Gallinula chloropus*
SC		Common loon	*Gavia immer*
T		American oystercatcher	*Haematopus palliatus*
T		Bald eagle	*Haliaeetus leucocephalus*
E		Yellow-breasted chat	*Icteria virens*
T		Least bittern	*Ixobrychus exilis*
E		Black rail (nesting population only)	*Laterallus jamaicensis*
E		Red-headed woodpecker	*Melanerpes erythrocephalus*
SC	E	Eskimo curlew*	*Numenius borealis*
SC		Yellow-crowned night-heron	*Nyctanassa violacea*
SC		Northern parula	*Parula americana*

State	Federal	Common Name	Scientific Name
SC		Savannah sparrow	*Passerculus sandwichensis*
SC		Ipswich sparrow (wintering populations)	*Passerculus sandwichensis ssp. princeps*
SC		Glossy ibis	*Plegadis falcinellus*
E		Pied-billed grebe	*Podilymbus podiceps*
E		Vesper sparrow	*Pooecetes gramineus*
T		Purple martin	*Progne subis*
E		King rail (nesting population only)	*Rallus elegans*
E	E	Roseate tern	*Sterna dougallii*
SC		Common tern	*Sterna hirundo*
T		Least tern	*Sternula antillarum*
SC		Eastern meadowlark	*Sturnella magna*
SC		Brown thrasher	*Toxostoma rufum*
E		Barn owl	*Tyto alba*
E		Golden-winged warbler	*Vermivora chrysoptera*
Reptiles			
T		Loggerhead sea turtle	*Caretta caretta*
T	T	Atlantic green sea turtle	*Chelonia mydas*
E		Timber rattlesnake	*Crotalus horridus*
E	E	Leatherback	*Dermochelys coriacea*
	E	Hawksbill sea turtle	*Eretmochelys imbircata*
T		Five-lined skink	*Eumeces fasciatus*
SC		Wood turtle	*Glyptemys insculpta*
E	T	Bog turtle	*Glyptemys muhlenbergii*
SC		Eastern hognose snake	*Heterodon platirhinos*
E	E	Atlantic/Kemps ridley sea turtle	*Lepidochelys kempii*
SC		Smooth green snake	*Liochlorophis vernalis*
SC		Eastern box turtle	*Terrapene carolina carolina*

State	Federal	Common Name	Scientific Name
SC		Eastern ribbon snake	*Thamnophis sauritus*
Amphibians			
SC		Jefferson salamander "complex"	*Ambystoma jeffersonianum*
E		Blue-spotted salamander (diploid populations)	*Ambystoma laterale*
SC		Blue-spotted salamander "complex"	*Ambystoma laterale*
T		Northern spring salamander	*Gyrinophilus porphyriticus*
T		Northern slimy salamander	*Plethodon glutinosus*
SC		Northern leopard frog	*Rana pipiens*
E		Eastern spadefoot	*Scaphiopus holbrookii*
Fish			
E	E	Shortnose sturgeon	*Acipenser brevirostrum*
T		Atlantic sturgeon	*Acipenser oxyrinchus oxyrinchus*
SC		Blueback herring	*Alosa aestivalis*
SC		Longnose sucker	*Catostomus catostomus*
SC		Banded sunfish	*Enneacanthus obesus*
E		American brook lamprey	*Lampetra appendix*
E		Burbot	*Lota lota*
SC		Bridle shiner	*Notropis bifrenatus*
E		Rainbow smelt (anadromous populations only)	*Osmerus mordax*
Insects			
T		Coastal heathland cutworm	*Abagrotis nefascia benjamini*
SC		Barrens dagger moth*	*Acronicta albarufa*
SC		Noctuid moth*	*Acronicta lanceolaria*
SC		Ground beetle	*Agonum darlingtoni*
SC		Ground beetle	*Agonum mutatum*
SC		Spotted dart moth	*Agrotis stigmosa*

State	Federal	Common Name	Scientific Name
SC		Ground beetle	*Amara chalcea*
E		Common roadside skipper	*Amblyscirtes vialis*
E		Noctuid moth	*Anarta luteola*
SC		Tusked sprawler	*Anthopotamus verticis*
SC		Apamea moth	*Apamea burgessi*
SC		Apamea moth	*Apamea inordinata*
SC		Apamea moth	*Apamea lintneri*
T		New Jersey tea inchworm	*Apodrepanulatrix liberaria*
SC		Short-lined chocolate	*Argyrostrotis anilis*
SC		Tabanid fly	*Atylotus ohioensis*
SC		Ground beetle	*Badister transversus*
SC		Ground beetle	*Bembidion carinula*
SC		Ground beetle	*Bembidion lacunarium*
SC		Ground beetle	*Bembidion planum*
SC		Ground beetle	*Bembidion pseudocautum*
SC		Ground beetle	*Bembidion quadratulum*
SC		Ground beetle	*Bembidion semicinctum*
SC		Ground beetle	*Bembidion simplex*
SC		Affable bumblebee	*Bombus affinis*
SC		Ashton's bumblebee*	*Bombus ashtoni*
SC		Yellowbanded bumblebee	*Bombus terricola*
SC		Bombardier beetle	*Brachinus cyanipennis*
SC		Bombardier beetle	*Brachinus fumans*
SC		Bombardier beetle	*Brachinus medius*
SC		Bombardier beetle	*Brachinus ovipennis*
SC		Bombardier beetle	*Brachinus patruelis*
E		Northern metalmark	*Calephelis borealis*

State	Federal	Common Name	Scientific Name
SC		Henry's elfin	*Callophrys henrici*
E		Hessel's hairstreak	*Callophrys hesseli*
T		Frosted elfin	*Callophrys irus*
SC		Hoary elfin*	*Callophrys polios*
T		Sparkling jewelwing	*Calopteryx dimidiata*
SC		Ground beetle*	*Calosoma wilcoxi*
SC		Ground beetle*	*Carabus serratus*
SC		Ground beetle*	*Carabus sylvosus*
SC		Ground beetle	*Carabus vinctus*
E		Herodias underwing	*Catocala herodias gerhardi*
SC		Precious underwing moth*	*Catocala pretiosa pretiosa*
T		Appalachian blue	*Celastrina neglectamajor*
SC		Noctuid moth	*Chaetaglaea cerata*
SC		Harris' checkerspot*	*Chlosyne harrisii*
SC		Silvery checkerspot*	*Chlosyne nycteis*
SC	T	Northeastern beach tiger beetle*	*Cicindela dorsalis dorsalis*
SC		Pine barrens tiger beetle	*Cicindela formosa generosa*
SC		Tiger beetle	*Cicindela hirticollis*
E		Dune ghost tiger beetle	*Cicindela lepida*
SC		Tiger beetle	*Cicindela marginata*
E	E	Puritan tiger beetle	*Cicindela puritana*
SC		Tiger beetle*	*Cicindela purpurea*
SC		Dark-bellied tiger beetle	*Cicindela tranquebarica*
SC		Regal moth*	*Citheronia regalis*
SC		C9 Lady beetle*	*Coccinella novemnotata*
T		Tiger spiketail	*Cordulegaster erronea*
SC		Noctuid moth*	*Cucullia speyeri*

State	Federal	Common Name	Scientific Name
T		False heather underwing	*Drasteria graphica atlantica*
SC		Imperial moth*	*Eacles imperialis imperialis*
T		Atlantic bluet	*Enallagma doubledayi*
SC		Little bluet	*Enallagma minusculum*
SC		Scarlet bluet	*Enallagma pictum*
E		Macropis cuckoo	*Epeoloides pilosula*
T		Sleepy duskywing	*Erynnis brizo*
SC		Horace's duskywing	*Erynnis horatius*
E		Columbine duskywing	*Erynnis lucilius*
SC		Mottled duskywing*	*Erynnis martialis*
E		Persius duskywing	*Erynnis persius persius*
SC		Scrub euchlaena	*Euchlaena madusaria*
SC		Noctuid moth	*Eucoptocnemis fimbriaris*
T		Morrison's mosaic	*Eucosma morrisoni*
SC		Brown-bordered geometer	*Eumacaria latiferrugata*
T		Two-spotted skipper	*Euphyes bimacula*
SC		Sedge skipper	*Euphyes dion*
SC		Noctuid moth	*Euxoa pleuritica*
T		Violet dart moth	*Euxoa violaris*
SC		Pitcher plant moth	*Exyra fax*
T		Pink streak	*Faronta rubripennis*
SC		Ground beetle	*Geopinus incrassatus*
T		Mustached clubtail	*Gomphus adelphus*
T		Harpoon clubtail	*Gomphus descriptus*
T		Midland clubtail	*Gomphus fraternus*
T		Rapids clubtail	*Gomphus quadricolor*
SC		Cobra clubtail	*Gomphus vastus*

State	Federal	Common Name	Scientific Name
SC		Skillet clubtail	*Gomphus ventricosus*
SC		Horse fly	*Goniops chrysocoma*
E		Phyllira tiger moth	*Grammia phyllira*
E		Bog tiger moth	*Grammia speciosa*
SC		Ground beetle	*Harpalus caliginosus*
SC		Ground beetle	*Harpalus eraticus*
SC		Ground beetle	*Helluomorphoides praeustus bicolor*
T		Slender clearwing	*Hemaris gracilis*
E		Buck moth	*Hemileuca maia maia*
T		American rubyspot	*Hetaerina americana*
T		Horse fly	*Hybomitra frosti*
E		Horse fly	*Hybomitra longiglossa*
SC		Horse fly	*Hybomitra luridus*
SC		Horse fly	*Hybomitra trepida*
SC		Horse fly	*Hybomitra typhus*
SC		Hop vine borer moth*	*Hydraecia immanis*
SC		Blue corporal dragonfly	*Ladona deplanata*
SC		Noctuid moth	*Lepipolys perscripta*
T		Crimson-ringed whiteface	*Leucorrhinia glacialis*
SC		Lemmer's noctuid moth*	*Lithophane lemmeri*
SC		Pale green pinion moth*	*Lithophane viridipallens*
SC		Yellow-horned beaded lacewing	*Lomamyia flavicornis*
SC		Black lordithon rove beetle*	*Lordithon niger*
SC		Ground beetle	*Loxandrus vulneratus*
SC		Bog copper	*Lycaena epixanthe*
SC		Bronze copper	*Lycaena hyllus*
SC		Fringed loosestrife oil-bee	*Macropis ciliata*

State	Federal	Common Name	Scientific Name
SC		Eastern cactus-boring moth	*Melitara prodenialis*
SC		Newman's brocade	*Meropleon ambifuscum*
SC		Tabanid fly	*Merycomyia whitneyi*
E		Barrens metarranthis moth	*Metarranthis apiciaria*
SC		Syrphid fly*	*Mixogaster johnsoni*
SC		Ground beetle	*Nebria lacustris lacustris*
SC	E	American burying beetle*	*Nicrophorus americanus*
SC		Ground beetle*	*Omophron tesselatum*
SC		Dune oncocnemis	*Oncocnemis riparia*
SC		Ground beetle*	*Panagaeus fasciatus*
E		Pitcher plant borer	*Papaipema appassionata*
SC		Hops-stalk borer moth*	*Papaipema circumlucens*
SC		Seaside goldenrod stem borer	*Papaipema duovata*
T		Columbine borer	*Papaipema leucostigma*
SC		Maritime sunflower borer moth*	*Papaipema maritima*
SC		Culvers root bore moth*	*Papaipema sciata*
SC		Mayfly	*Paraleptophlebia assimilis*
T		Lanced phaneta	*Phaneta clavana*
E		Labrador tea tentiform leafminer	*Phyllonorycter ledella*
SC		Gray comma*	*Polygonia progne*
T		Common sanddragon	*Progomphus obscurus*
T		Pink sallow	*Psectraglaea carnosa*
SC		Annointed sallow moth*	*Pyreferra ceromatica*
SC		Aureolaria seed borer	*Rhodoecia aurantiago*
SC		Soldier fly	*Sargus fasciatus*
SC		Eyed brown	*Satyrodes eurydice*
SC		Ground beetle*	*Scaphinotus elevatus*

State	Federal	Common Name	Scientific Name
SC		Ground beetle	*Scaphinotus viduus*
SC		Noctuid moth	*Schinia spinosae*
SC		Ski-tailed emerald	*Somatochlora elongata*
SC		Spartina borer moth	*Spartiniphaga inops*
T		Barrens itame	*Speranza exornata*
T		Atlantis fritillary butterfly	*Speyeria atlantis*
SC		Regal fritillary*	*Speyeria idalia*
SC		Tabanid fly	*Stonemyia isabellina*
T		Riverine clubtail	*Stylurus amnicola*
SC		Horse fly	*Tabanus fulvicallus*
SC		Ground beetle	*Tetragonoderus fasciatus*
T		Grassland thaumatopsis	*Thaumatopsis edonis*
SC		Cicada	*Tibicen auletes*
E		Banded bog skimmer	*Williamsonia lintneri*
T		Noctuid moth	*Zale curema*
SC		Noctuid moth	*Zale obliqua*
T		Noctuid moth	*Zale submediana*
T		Noctuid moth	*Zanclognatha martha*
Other Invertebrates			
E	E	Dwarf wedge mussel	*Alasmidonta heterodon*
E		Brook floater	*Alasmidonta varicosa*
SC		Mystic valley amphipod	*Crangonyx aberrans*
E		Fairy shrimp	*Eubranchipus holmanii*
SC		Clam shrimp*	*Eulimnadia agassizii*
SC		Lymnaeid snail*	*Fossaria galbana*
SC		Lymnaeid snail	*Fossaria rustica*
SC		Aquatic snail	*Gyraulus circumstriatus*

State	Federal	Common Name	Scientific Name
E		Yellow lamp mussel	*Lampsilis cariosa*
SC		Tidewater mucket	*Leptodea ochracea*
SC		Eastern pond mussel	*Ligumia nasuta*
SC		Eastern pearl shell	*Margaritifera margaritifera*
SC		Slender walker	*Pomatiopsis lapidaria*
SC		Whiteriver crayfish	*Procambarus acutus*
SC		Purse web spider	*Sphodros niger*
SC		Lymnaeid snail	*Stagnicola catascopium*
SC		Piedmont groundwater amphipod	*Stygobromus tenuis tenuis*
SC		Coastal pond amphipod	*Synurella chamberlaini*
SC		Boreal turret snail	*Valvata sincera*
SC		Turret snail	*Valvata tricarinata*
Plants			
E		Balsam fir (native populations only)	*Abies balsamea*
SC		Virginia copperleaf	*Acalypha virginica*
E	E	Sandplain gerardia	*Agalinis acuta*
E		Yellow giant hyssop	*Agastache nepetoides*
E		Purple giant hyssop	*Agastache scrophulariifolia*
E		Small white snakeroot	*Ageratina aromatica*
T		Orange foxtail	*Alopecurus aequalis*
SC	T	Sea-beach amaranth*	*Amaranthus pumilus*
T		Bog rosemary	*Andromeda polifolia var. glaucophylla*
T		Canada anemone	*Anemone canadensis*
E		Sea-coast angelica	*Angelica lucida*
SC		Hairy angelica*	*Angelica venenosa*
SC		Field pussytoes*	*Antennaria howellii ssp. petaloidea*
SC		Puttyroot*	*Aplectrum hyemale*

State	Federal	Common Name	Scientific Name
E		Dwarf mistletoe	*Arceuthobium pusillum*
SC		Arethusa*	*Arethusa bulbosa*
SC		Needlegrass	*Aristida longespica*
SC		Arrowfeather	*Aristida purpurascens*
E		Beach needle grass	*Aristida tuberculosa*
SC		Virginia snakeroot	*Aristolochia serpentaria*
SC		Purple milkweed	*Asclepias purpurascens*
SC		White milkweed*	*Asclepias variegata*
E		Green milkweed	*Asclepias viridiflora*
SC		Mountain spleenwort	*Asplenium montanum*
T		Wallrue spleenwort	*Asplenium ruta-muraria*
SC		Orache	*Atriplex glabriuscula*
SC		Swamp birch	*Betula pumila*
T		Water-marigold	*Bidens beckii*
T		Eaton's beggars-tick	*Bidens eatonii*
SC		Downy wood-mint*	*Blephilia ciliata*
SC		Hairy woodmint*	*Blephilia hirsuta*
SC		Bayonet grass	*Bolboschoenus maritimus ssp. paludosus*
SC		Salt marsh bulrush	*Bolboschoenus novae-angliae*
SC		Little grape fern*	*Botrychium simplex*
E		Side-oats grama-grass	*Bouteloua curtipendula*
SC		Reed bentgrass	*Calamagrostis stricta ssp. inexpansa*
SC		Low bindweed*	*Calystegia spithamaea*
SC		Purple cress	*Cardamine douglassii*
SC		Summer sedge	*Carex aestivalis*
E		Broadwing sedge	*Carex alata*
T		Foxtail sedge	*Carex alopecoidea*

State	Federal	Common Name	Scientific Name
SC		Sedge	*Carex aquatilis var. aquatilis*
E		Sedge	*Carex backii*
E		Barratt's sedge	*Carex barrattii*
SC		Sedge	*Carex bushii*
E		Brown bog sedge	*Carex buxbaumii*
E		Chestnut-colored sedge	*Carex castanea*
SC		Collins sedge*	*Carex collinsii*
T		Crawe's sedge	*Carex crawei*
SC		Crawford sedge*	*Carex crawfordii*
T		Clustered sedge	*Carex cumulata*
T		Davis' sedge	*Carex davisii*
E		Sedge	*Carex exilis*
SC		Bronze sedge*	*Carex foenea*
SC		Handsome sedge	*Carex formosa*
SC		Hitchcock's sedge	*Carex hitchcockiana*
T		Sedge	*Carex limosa*
E		Sedge	*Carex magellanica*
SC		Troublesome sedge	*Carex molesta*
SC		Black-edge sedge*	*Carex nigromarginata*
SC		New England sedge	*Carex novae-angliae*
SC		Eastern few-fruited sedge	*Carex oligocarpa*
SC		Few-seeded sedge*	*Carex oligosperma*
SC		Few-flowered sedge*	*Carex pauciflora*
E		Variable sedge	*Carex polymorpha*
SC		Prairie sedge	*Carex prairea*
E		Cyprus-like sedge	*Carex pseudocyperus*
E		Schweinitz's sedge	*Carex schweinitzii*

State	Federal	Common Name	Scientific Name
SC		Sedge	*Carex squarrosa*
SC		Dioecious sedge	*Carex sterilis*
SC		Sedge	*Carex trichocarpa*
SC		Tuckerman's sedge	*Carex tuckermanii*
SC		Sedge	*Carex typhina*
E		Little green sedge	*Carex viridula*
E		Willdenow's sedge	*Carex willdenowii*
T		Indian paintbrush	*Castilleja coccinea*
SC		Eastern redbud (native populations only)*	*Cercis canadensis*
E		Devil's-bit	*Chamaelirium luteum*
E		Hairy lip-fern	*Cheilanthes lanosa*
SC		Coast blite*	*Chenopodium rubrum*
E		Yellow thistle	*Cirsium horridulum*
E		Long-bracted green orchid	*Coeloglossum viride*
SC		Early coral root	*Corallorhiza trifida*
T		Yellow corydalis	*Corydalis flavula*
E		Pygmyweed	*Crassula aquatica*
SC		Elliptical rushfoil*	*Croton willdenowii*
E		Slender cliff-brake	*Cryptogramma stelleri*
SC		Blue waxweed*	*Cuphea viscosissima*
SC		Hazel dodder*	*Cuscuta coryli*
SC		Wild comfrey*	*Cynoglossum virginianum*
SC		Ram's-head lady's-slipper*	*Cypripedium arietinum*
SC		Yellow lady's-slipper	*Cypripedium parviflorum*
E		Showy lady's-slipper	*Cypripedium reginae*
E		Dew-drop	*Dalibarda repens*

State	Federal	Common Name	Scientific Name
SC		Tufted hairgrass	*Deschampsia caespitosa*
E		Large-bracted tick-trefoil	*Desmodium cuspidatum*
SC		Dillenius' tick-trefoil	*Desmodium glabellum*
E		Trailing tick-trefoil	*Desmodium humifusum*
SC		Sessile-leaf tick-trefoil*	*Desmodium sessilifolium*
SC		Squirrel corn	*Dicentra canadensis*
SC		Panic grass	*Dichanthelium ovale var. addisonii*
E		Panic grass	*Dichanthelium scabriusculum*
SC		Panic grass*	*Dichanthelium sphaerocarpon var. isophyllum*
SC		Panic grass*	*Dichanthelium xanthophysum*
SC		Persimmon	*Diospyros virginiana*
E		Narrow-leaved glade fern	*Diplazium pycnocarpon*
SC		Whitlow-grass	*Draba reptans*
SC		Thread-leaf sundew*	*Drosera filiformis*
E		Mountain wood-fern	*Dryopteris campyloptera*
SC		Goldie's fern	*Dryopteris goldiana*
E		Bur-head	*Echinodorus tenellus*
E		Horse-tail spike-rush	*Eleocharis equisetoides*
SC		Spike-rush*	*Eleocharis microcarpa var. filiculmis*
E		Spike-rush	*Eleocharis quadrangulata var. crassior*
SC		Wiegand's wild rye	*Elymus wiegandii*
SC		Marsh horsetail*	*Equisetum palustre*
E		Meadow horsetail	*Equisetum pratense*
E		Dwarf scouring rush	*Equisetum scirpoides*
E		Parker's pipewort	*Eriocaulon parkeri*
T		Hare's tail	*Eriophorum vaginatum var. spissum*

State	Federal	Common Name	Scientific Name
E		White thoroughwort	*Eupatorium album*
E		Rough aster	*Eurybia radula*
T		Showy aster	*Eurybia spectabilis*
SC		Hervey's aster	*Eurybia X herveyi*
E		False mermaid-weed	*Floerkea proserpinacoides*
E		Bog bedstraw	*Galium labradoricum*
SC		Purple cudweed*	*Gamochaeta purpurea*
SC		Creeping snowberry	*Gaultheria hispidula*
T		Dwarf huckleberry	*Gaylussacia dumosa var. bigeloviana*
E		Stiff gentian	*Gentianella quinquefolia*
SC		Bicknell's northern crane's-bill*	*Geranium bicknellii*
SC		Dwarf rattlesnake plantain*	*Goodyera repens var. ophioides*
E		Sweet-scented Indian-plantain	*Hasteola suaveolens*
SC		Bush rockrose*	*Helianthemum dumosum*
T		Low frostweed	*Helianthemum propinquum*
SC		Sharp-lobed hepatica	*Hepatica nobilis var. acuta*
SC		Kidneyleaf mud-plantain*	*Heteranthera reniformis*
SC		Seabeach sandwort	*Honckenya peploides*
SC		Featherfoil	*Hottonia inflata*
T		Longleaf bluet	*Houstonia longifolia*
E		Golden-heather	*Hudsonia ericoides*
T		False beach-heather	*Hudsonia tomentosa*
SC		Fir clubmoss*	*Huperzia selago*
SC		Green violet*	*Hybanthus concolor*
E		Golden seal	*Hydrastis canadensis*
E		Water pennywort	*Hydrocotyle umbellata*
E		Whorled pennywort	*Hydrocotyle verticillata*

State	Federal	Common Name	Scientific Name
SC		Virginia waterleaf	*Hydrophyllum virginianum*
SC		Creeping St. John's-wort*	*Hypericum adpressum*
SC		Great St. John's-wort	*Hypericum ascyron*
T		Inkberry (native populations only)	*Ilex glabra*
E	T	Small whorled pogonia	*Isotria medeoloides*
SC		Weak rush*	*Juncus debilis*
SC		Two-flowered cynthia	*Krigia biflora*
E		Carolina redroot (native populations only)	*Lachnanthes caroliana*
E		Saltpond grass	*Leptochloa fusca ssp. fascicularis*
SC		Creeping bush-clover	*Lespedeza repens*
SC		Blazing star	*Liatris scariosa var. novae-angliae*
E		Scotch lovage	*Ligusticum scothicum*
SC		Lilaeopsis	*Lilaeopsis chinensis*
SC		Mudwort	*Limosella australis*
E		Twinflower	*Linnaea borealis ssp. americana*
SC		Sandplain flax*	*Linum intercursum*
E		Yellow flax	*Linum sulcatum*
E		Lily-leaved twayblade	*Liparis liliifolia*
T		Dwarf bulrush	*Lipocarpha micrantha*
SC		Sweet gum (native populations only)	*Liquidambar styraciflua*
SC		Many-fruited false-loosestrife*	*Ludwigia polycarpa*
E		Globe-fruited false-loosestrife	*Ludwigia sphaerocarpa*
E		Foxtail clubmoss	*Lycopodiella alopecuroides*
SC		Clasping-leaved water-horehound	*Lycopus amplectens*
SC		Climbing fern	*Lygodium palmatum*
SC		Stagger-bush*	*Lyonia mariana*

State	Federal	Common Name	Scientific Name
E		Winged loosestrife	*Lythrum alatum*
T		Three-leaved false Solomon's-seal	*Maianthemum trifolium*
E		Bayard's white adder's mouth	*Malaxis bayardii*
E		White adder's-mouth	*Malaxis brachypoda*
E		Green adder's-mouth	*Malaxis unifolia*
E		Tall millet-grass	*Milium effusum*
T		Mountain sandwort	*Minuartia glabra*
SC		Naked miterwort	*Mitella nuda*
E		Large-leaved sandwort	*Moehringia macrophylla*
E		One-flower wintergreen	*Moneses uniflora*
E		Red mulberry	*Morus rubra*
E		Long-awn hairgrass	*Muhlenbergia capillaris*
E		Slender water-milfoil	*Myriophyllum alterniflorum*
E		Cutleaf water-milfoil	*Myriophyllum pinnatum*
T		Northern water-milfoil	*Myriophyllum sibiricum*
SC		Large yellow pond lily*	*Nuphar advena*
SC		Small yellow pond lily	*Nuphar microphylla*
E		Bog aster	*Oclemena nemoralis*
E		Blake's aster	*Oclemena X blakei*
SC		Sundrops*	*Oenothera fruticosa*
E		Prairie goldenrod	*Oligoneuron album*
E		Stiff goldenrod	*Oligoneuron rigidum*
E		Gravel-weed	*Onosmodium virginianum*
T		Adder's-tongue	*Ophioglossum pusillum*
SC		Eastern prickly pear	*Opuntia humifusa*
SC		Golden club	*Orontium aquaticum*
SC		One-sided pyrola*	*Orthilia secunda*

State	Federal	Common Name	Scientific Name
SC		Violet wood-sorrel	*Oxalis violacea*
T		Ragwort	*Packera paupercula*
SC		American ginseng	*Panax quinquefolius*
T		Panic grass	*Panicum amarum*
SC		Tall flat panic-grass*	*Panicum rigidulum var. elongatum*
SC		Warty panic grass*	*Panicum verrucosum*
SC		Hairy forked chickweed*	*Paronychia fastigiata*
E		Field paspalum	*Paspalum laeve*
SC		Bead grass*	*Paspalum setaceum*
T		Swamp lousewort	*Pedicularis lanceolata*
E		Smooth cliff-brake	*Pellaea glabella*
T		Sweet coltsfoot	*Petasites frigidus var. palmatus*
SC		Wild kidney bean*	*Phaseolus polystachios var. polystachios*
E		Red pine (native populations only)	*Pinus resinosa*
E		Slender mountain ricegrass	*Piptatherum pungens*
E		Sickle-leaved golden aster	*Pityopsis falcata*
SC		Hoary plantain	*Plantago virginica*
E		White-fringed orchid	*Platanthera blephariglottis*
T		Yellow-fringed orchid	*Platanthera ciliaris*
SC		Tall white bog orchid*	*Platanthera dilatata*
SC		Pale green orchid	*Platanthera flava var. herbiola*
SC		Hooker's orchid*	*Platanthera hookeri*
SC		Large round-leaved orchid*	*Platanthera orbiculata*
SC		Threadfoot	*Podostemum ceratophyllum*
SC		Clammy-weed*	*Polanisia dodecandra*
E		Field milkwort	*Polygala cruciata*
E		Nuttall's milkwort	*Polygala nuttallii*

State	Federal	Common Name	Scientific Name
E		Seneca snakeroot	*Polygala senega*
SC		Seabeach knotweed*	*Polygonum glaucum*
E		Small-flowered leafcup	*Polymnia canadensis*
T		Swamp cottonwood	*Populus heterophylla*
E		Pondweed	*Potamogeton confervoides*
E		Fries' pondweed	*Potamogeton friesii*
E		Hill's pondweed	*Potamogeton hillii*
E		Ogden's pondweed	*Potamogeton ogdenii*
T		Capillary pondweed	*Potamogeton pusillus ssp. gemmiparus*
E		Straight-leaved pondweed	*Potamogeton strictifolius*
T		Vasey's pondweed	*Potamogeton vaseyi*
SC		Tall cinquefoil	*Potentilla arguta*
SC		Alleghany plum*	*Prunus alleghaniensis*
SC		Grave's beach plum*	*Prunus maritima var. gravesii*
SC		Goose grass*	*Puccinellia tenella ssp. alaskana*
E		Basil mountain-mint	*Pycnanthemum clinopodioides*
E		Torrey mountain-mint	*Pycnanthemum torrei*
SC		Bur oak	*Quercus macrocarpa*
E		Water-plantain spearwort	*Ranunculus ambigens*
E		Seaside crowfoot	*Ranunculus cymbalaria*
SC		Creeping spearwort*	*Ranunculus flammula var. filiformis*
SC		White water-crowfoot	*Ranunculus longirostris*
SC		Bristly buttercup*	*Ranunculus pensylvanicus*
T		Labrador tea	*Rhododendron groenlandicum*
SC		Fragrant sumac (native populations only)*	*Rhus aromatica*
E		Capillary beak-rush	*Rhynchospora capillacea*

State	Federal	Common Name	Scientific Name
T		Beaked rush	*Rhynchospora macrostachya*
E		Long-beaked bald rush	*Rhynchospora scirpoides*
SC		Skunk currant	*Ribes glandulosum*
SC		Swamp black currant*	*Ribes lacustre*
SC		Wild currant	*Ribes rotundifolium*
E		Swamp red currant	*Ribes triste*
SC		Shining rose	*Rosa nitida*
T		Toothcup	*Rotala ramosior*
SC		Sand bramble	*Rubus cuneifolius*
SC		Sea-side dock*	*Rumex maritimus*
SC		Large marsh pink*	*Sabatia dodecandra*
E		Marsh pink	*Sabatia stellaris*
E		Waputo	*Sagittaria cuneata*
SC		Arrowleaf	*Sagittaria subulata*
T		Sandbar willow	*Salix exigua*
E		Bog willow	*Salix pedicellaris*
SC		Slender willow	*Salix petiolaris*
SC		Autumn willow	*Salix serissima*
E		Lizard's tail	*Saururus cernuus*
E		Pod grass	*Scheuchzeria palustris ssp. americana*
SC		Purple oat	*Schizachne purpurascens*
T		Hard-stemmed bulrush	*Schoenoplectus acutus*
T		Torrey bulrush	*Schoenoplectus torreyi*
SC	E	American Chaffseed*	*Schwalbea americana*
SC		Georgia bulrush	*Scirpus georgianus*
SC		Long's bulrush*	*Scirpus longii*
E		Few-flowered nutrush	*Scleria pauciflora var. caroliniana*

State	Federal	Common Name	Scientific Name
E		Reticulated nutrush	*Scleria reticularis*
E		Nutrush	*Scleria triglomerata*
SC		Low nutrush*	*Scleria verticillata*
E		Hyssop skullcap	*Scutellaria integrifolia*
E		Small skullcap	*Scutellaria parvula var. missouriensis*
SC		Wild senna	*Senna hebecarpa*
T		Three-toothed cinquefoil	*Sibbaldiopsis tridentata*
T		Starry champion	*Silene stellata*
SC		Bristly greenbriar*	*Smilax hispida*
SC		Elliott's goldenrod	*Solidago latissimifolia*
SC		Early wrinkle-leaved goldenrod*	*Solidago rugosa var. sphagnophila*
E		Floating bur-reed	*Sparganium fluctuans*
E		Small bur-reed	*Sparganium natans*
T		Canada sand-spurry	*Spergularia canadensis*
SC		Little ladies'-tresses	*Spiranthes tuberosa var. grayi*
E		Rough dropseed	*Sporobolus clandestinus*
T		Sand dropseed	*Sporobolus cryptandrus*
E		Northern dropseed	*Sporobolus heterolepis*
E		Small dropseed	*Sporobolus neglectus*
E		Hyssop-leaf hedge-nettle	*Stachys hyssopifolia*
SC		Smooth hedge-nettle	*Stachys tenuifolia*
SC		Northern stitchwort	*Stellaria borealis*
T		White mandarin	*Streptopus amplexifolius*
SC		Crooked-stem aster*	*Symphyotrichum prenanthoides*
E		Yellow pimpernel	*Taenidia integerrima*
T		Northern white cedar (native populations only)	*Thuja occidentalis*

State	Federal	Common Name	Scientific Name
SC		Appalachian gametophyte	*Trichomanes intricatum*
SC		Cotton bulrush*	*Trichophorum alpinum*
E		False pennyroyal	*Trichostema brachiatum*
E		Narrow-leaved horse gentian	*Triosteum angustifolium*
E		Nodding pogonia	*Triphora trianthophora*
SC		Spiked false oats	*Trisetum spicatum*
T		Spreading globe flower	*Trollius laxus*
E		Bladderwort	*Utricularia resupinata*
E		Large-flowered bellwort	*Uvularia grandiflora*
E		Velvetleaf blueberry	*Vaccinium myrtilloides*
SC		Mountain cranberry*	*Vaccinium vitis-idaea ssp. minus*
SC		Beaked corn-salad*	*Valerianella radiata*
SC		Hybrid bunchflower*	*Veratrum latifolium*
SC		Narrow-leaved vervain*	*Verbena simplex*
SC		Possum haw*	*Viburnum nudum*
SC		Smooth black-haw	*Viburnum prunifolium*
SC		Hook-spurred violet	*Viola adunca*
E		Coast violet	*Viola brittoniana*
SC		Canada violet	*Viola canadensis*
SC		Southern wood violet*	*Viola hirsutula*
SC		Northern bog violet	*Viola nephrophylla*
SC		Kidney-leaf white violet*	*Viola renifolia*
SC		Great-spurred violet	*Viola selkirkii*
SC		Striped violet*	*Viola striata*
SC		New England grape	*Vitis X novae-angliae*
E		Barren strawberry	*Waldsteinia fragarioides*
T		Northern yellow-eyed grass	*Xyris montana*

State	Federal	Common Name	Scientific Name
E		Small's yellow-eyed	*Xyris smalliana*
E		Golden Alexanders	*Zizia aptera*

Effective July 1, 2010
* Extirpated

APPENDIX D
USFWS NEFO "No Species Present" Letter

United States Department of the Interior

FISH AND WILDLIFE SERVICE

New England Field Office
70 Commercial Street, Suite 300
Concord, NH 03301-5087
http://www.fws.gov/newengland

January 17, 2012

To Whom It May Concern:

This project was reviewed for the presence of federally listed or proposed, threatened or endangered species or critical habitat per instructions provided on the U.S. Fish and Wildlife Service's New England Field Office website:

(http://www.fws.gov/newengland/EndangeredSpec-Consultation.htm)

Based on information currently available to us, no federally listed or proposed, threatened or endangered species or critical habitat under the jurisdiction of the U.S. Fish and Wildlife Service are known to occur in the project area(s). Preparation of a Biological Assessment or further consultation with us under section 7 of the Endangered Species Act is not required. No further Endangered Species Act coordination is necessary for a period of one year from the date of this letter, unless additional information on listed or proposed species becomes available.

Thank you for your cooperation. Please contact Mr. Anthony Tur of this office at 603-223-2541 if we can be of further assistance.

Sincerely yours,

Thomas R. Chapman
Supervisor
New England Field Office