ENVIRONMENTAL ASSESSMENT

MANAGING DAMAGE TO RESOURCES AND THREATS TO HUMAN SAFETY CAUSED BY BIRDS IN THE STATE OF MAINE

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ACRONYMS

AI	Avian Influenza
AP	Atlantic Population
APHIS	Animal and Plant Health Inspection Service
AQDO	Aquaculture Depredation Order
AVMA	American Veterinary Medical Association
BBS	Breeding Bird Survey
BCR	Bird Conservation Region
CBC	Christmas Bird Count
CEQ	Council on Environmental Quality
CDC	Centers for Disease Control and Prevention
CFR	Code of Federal Regulations
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
ESC	Enteric Septicemia of Catfish
FAA	Federal Aviation Administration
FDA	Food and Drug Administration
FEIS	Final Environmental Impact Statement
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FR	Federal Register
FY	Fiscal Year
HP	Highly Pathogenic
INAD	Investigational New Animal Drug
IPN	Infectious Pancreatic Necrosis
LD	Lethal Dose
MANEM	Mid-Atlantic/New England/Maritime
MDABPC	Maine Department of Agriculture Board of Pesticides Control
MDIFW	Maine Department of Inland Fisheries and Wildlife
MOU	Memorandum of Understanding
MBTA	Migratory Bird Treaty Act
NAP	North Atlantic Population
NAS	National Audubon Society
NASS	National Agricultural Statistics Service
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NWRC	National Wildlife Research Center
PL	Public Law
PRDO	Public Resource Depredation Order
ROD	Record of Decision
SJBP	Southern James Bay Population
SVC	Spring Viraemia of Carp
SOP	Standard Operating Procedure
T&E	Threatened and Endangered
USAF	U.S. Air Force
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	United States Geological Survey
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 Maine and the Migratory Bird Program within Region 5 of the United States Fish and Wildlife Service (USFWS)[2] continue 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 birds in Maine. Normally, individual projects conducted by the WS program to alleviate bird damage could be categorically excluded from further analysis pursuant to the National Environmental Policy Act (NEPA), in accordance with APHIS implementing regulations for the NEPA (7 CFR 372.5(c); 60 FR 6000-6003).

WS and the USFWS are developing this Environmental Assessment (EA) to evaluate cumulatively the individual projects conducted by WS to manage damage and threats to agricultural resources, property, natural resources, and threats to humans caused by double-crested cormorants (*Phalacrocorax auritus*), great blue herons (*Ardea herodias*), turkey vultures (*Cathartes aura*), Canada geese (*Branta canadensis*), feral waterfowl[3], American black ducks (*Anas rubripes*), mallards (*Anas platyrhynchos*), hooded mergansers (*Lophodytes cucullates*), common mergansers (*Mergus merganser*), red-breasted mergansers (*Mergus serrator*), ospreys (*Pandion haliaetus*), bald eagles (*Haliaeetus leucocephalus*), sharp-shinned hawks (*Accipiter striatus*), Cooper's hawks (*Accipiter cooperii*), red-tailed hawks (*Buteo jamaicensis*), American kestrels (*Falco sparverius*), Northern harriers (*Circus cyaneus*), wild turkeys (*Meleagris gallopavo*), rock pigeons (*Columba livia*), downy woodpeckers (*Picoides pubescens*), hairy woodpeckers (*Picoides villosus*), pileated woodpeckers (*Dryocopus pileatus*), American crows (*Corvus brachyrhynchos*), common ravens (*Corvus corax*), European starlings (*Sturnus vulgaris*), red-winged blackbirds (*Agelaius phoeniceus*), common grackles (*Quiscalus quiscula*), brown-headed cowbirds (*Molothrus ater*), and house sparrows (*Passer domesticus*). This EA will also evaluate the issuance of depredation permits by the Migratory Bird Program within the USFWS for the take of protected bird species in Maine pursuant to the Migratory Bird Treaty Act (MBTA) to alleviate damage or threats.

This EA will assist in determining if the proposed cumulative management of bird damage could have a significant effect on the environment based on previous activities conducted and based on the anticipation of conducting additional efforts to alleviate damage. Because the goal of WS would be to conduct a coordinated program to alleviate bird damage in accordance with plans, goals, and objectives developed to reduce damage, and because the program's goals and directives[4] would be to provide services when requested, within the constraints of available funding and workforce, it is conceivable that additional damage management efforts could occur. Thus, this EA anticipates those additional efforts and the analyses would be intended to apply to actions that may occur in any locale and at any time within Maine as part of a coordinated program. This EA analyzes the potential effects of bird damage management

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[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).

[2]The USFWS is responsible for managing and regulating bird species under the Migratory Bird Treaty Act (MBTA). The take of migratory birds is prohibited by the MBTA. However, the USFWS can issue depredation permits for the take of protected 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.

[3]Free-ranging or feral domestic waterfowl refers to captive-reared, domestic, of some domestic genetic stock, or domesticated breeds of ducks, geese, and swans. Examples of domestic waterfowl include, but are not limited to, mute swans, Muscovy ducks, Pekin ducks, Rouen ducks, Cayuga ducks, Swedish ducks, Chinese geese, Toulouse geese, Khaki Campbell ducks, Embden geese, and pilgrim geese. Feral ducks may include a combination of mallards, Muscovy duck, and mallard-Muscovy hybrids.

[4]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.

when requested, as coordinated between WS, the USFWS, and the Maine Department of Inland Fisheries and Wildlife (MDIFW).

WS and the USFWS are 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 activities; and 5) evaluate and determine if there would be any potentially significant or cumulative effects from the proposed program. The analyses contained in this EA are based on information derived from WS' Management Information System, published documents (see Appendix A), interagency consultations, and public involvement.

The 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 alternative approaches to meeting the need for action while addressing the identified issues. The issues and alternatives associated with bird damage management were initially developed by WS in cooperation with the USFWS, and in consultation with the MDIFW. The USFWS has overall regulatory authority to manage populations of bird species, while the MDIFW has the authority to manage wildlife populations in the State of Maine. To assist with identifying additional issues and alternatives to managing damage, this EA will be made available to the public for review and comment prior to the issuance a Decision[5].

WS previously developed an EA that addressed WS' activities to manage damage associated with rock pigeons, European starlings, house sparrows, red-winged blackbirds, brown-headed cowbirds, common grackles, common ravens, and American crows in Maine (USDA 2001*a*). Changes in the need for action and the affected environment have prompted WS and the USFWS to initiate this new analysis to address damage management activities in the State. This EA will address more recently identified changes and to assess the potential environmental impacts of program alternatives based on a new need for action. Since activities conducted under the previous EA will be re-evaluated under this EA to address the new need for action and the associated affected environment, the previous bird EA will be superseded by this analysis and the outcome of the Decision issued for the EA.

1.2 NEED FOR ACTION

Some species of wildlife have adapted to and have thrived in human altered habitats. Those species, in particular, are often responsible for the majority of conflicts between people and wildlife. Those conflicts often lead people to request assistance with reducing damage to resources and to reduce threats to human safety. Wildlife can have either positive or negative values depending on the perspectives and circumstances of individual people. In general, people regard wildlife as providing economic, recreational, and aesthetic benefits. Knowing that wildlife exists in the natural environment provides a positive benefit to some people. However, activities associated with wildlife may result in economic losses to agricultural resources, natural resources, property, and threaten human safety. Therefore, an awareness of the varying perspectives and values are required to balance the needs of people and the needs of wildlife. When addressing damage or threats of damage caused by wildlife, wildlife damage management professionals must consider not only the needs of those people directly affected by wildlife damage but a range of environmental, sociocultural, and economic considerations as well.

Both sociological and biological carrying capacities must be applied to resolve wildlife damage problems. The wildlife acceptance capacity, or cultural carrying capacity, is the limit of human tolerance for wildlife

[5]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 publish either 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.

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

The alleviation of damage or other problems caused by or related to the behavior of wildlife is termed wildlife damage management and is recognized as an integral component of wildlife management (The Wildlife Society 1992). The imminent threat of damage or loss of resources is often sufficient for individual actions to be initiated and the need for damage management is derived from the specific threats to resources. Those animals have no intent to do harm. They utilize habitats (*e.g.*, reproduce, walk, forage, deposit feces) where they can find a niche. If their activities result in lost economic value of resources or threaten human safety, people characterize this as damage. When damage exceeds or threatens to exceed an economic threshold and/or poses a threat to human safety, people often seek assistance with resolving damage or reducing threats to human safety.

The threshold triggering a request for assistance is often unique to the individual person requesting assistance and can be based on many factors (*e.g.*, economic, social, aesthetics). Therefore, how damage is defined can often be unique to an individual person and damage occurring to one individual may not be considered damage by another individual. However, the use of the term "*damage*" is consistently used to describe situations where an individual person has determined the losses associated with wildlife is actual damage requiring assistance (*i.e.*, has reached an individual threshold). The term "*damage*" is most often defined as economic losses to resources or threats to human safety. However, damage could also include a loss in aesthetic value and other situations where the actions of wildlife are no longer tolerable to an individual person.

Birds add an aesthetic component to the native environment, sometimes provide opportunities for recreational hunting, and like all wildlife, provide people with valued close contact with nature. Many people, even those people experiencing damage, may consider birds to be a charismatic and valuable component of their environment; however, tolerance differs among individual people. Because of their prolific nature, site tenacity, longevity, size, and tolerance of human activity, birds are often associated with situations where damage or threats can occur. For example, geese are extremely adaptable and may use the resources provided by humans in urban landscapes for nesting, molting, feeding, and loafing. Increasing populations of resident geese are resulting in increasing numbers of conflicts with human activities (Conover and Chasko 1985, USFWS 2005, Dolbeer and Seubert 2006), and increasing concerns related to human health and safety (Ankney 1996, Seubert and Dolbeer 2004, USFWS 2005, Dolbeer and Seubert 2006).

The need for action to manage damage and threats associated with birds in Maine arises from requests for assistance received by WS and the USFWS to reduce and prevent damage from occurring to four major categories. Those four major categories include agricultural resources, natural resources, property, and threats to human safety. WS has identified those bird species most likely to be responsible for causing damage to those four categories in Maine based on previous requests for assistance and assessments of the threat of bird strike hazards at airports in the State.

Table 1.1 lists those bird species and the resource types that those bird species can cause damage to in Maine. The need for action arises from requests for assistance that could be received by WS and the USFWS associated with those species. Many of the bird species addressed can cause damage to or pose threats to a variety of resources. Most requests for assistance received by WS are related to threats associated with those bird species being struck by aircraft at or near airports in the State.

Table 1.1 – Bird species that WS in Maine routinely receives requests for assistance and the resource type damage by those species

Species	Resource[a]				Species	Resource			
	A	N	P	H		A	N	P	H
Double-crested Cormorant	X	X	X	X	Red-tailed Hawk	X	X	X	X
Great Blue Heron	X	X	X	X	American Kestrel	X	X	X	X
Turkey Vulture	X		X	X	Northern Harrier			X	X
Canada Goose	X	X	X	X	Wild Turkey	X		X	X
Feral Goose	X	X	X	X	Rock Pigeon	X	X	X	X
American Black Duck	X	X	X	X	Downy Woodpecker		X	X	
Mallard	X	X	X	X	Hairy Woodpecker		X	X	
Feral Duck	X	X	X	X	Pileated Woodpecker		X	X	
Hooded Merganser		X	X	X	American Crow	X	X	X	X
Common Merganser		X	X	X	Common Raven	X	X	X	X
Red-breasted Merganser		X	X	X	European Starling	X	X	X	X
Osprey	X	X	X	X	Red-winged Blackbird	X		X	X
Bald Eagle			X	X	Common Grackle	X	X	X	X
Sharp-shinned Hawk	X	X	X	X	Brown-headed Cowbird	X	X	X	X
Cooper's Hawk	X	X	X	X	House Sparrow	X	X	X	X

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

From federal fiscal year[6] (FY) 2006 through FY 2011, the WS program in Maine has conducted 704 technical assistance projects addressing damage and threats associated with birds in the State. Technical assistance provides those persons interested with information and recommendations on effective methods to prevent damage that are legally available to the requestor. This information can then be employed by those persons requesting assistance to resolve damage issues without WS' direct involvement. Technical assistance projects were conducted to address damage to property, agricultural resources, natural resources, and human safety from FY 2006 through FY 2011. In addition, WS has also provided direct operational assistance when requested. Based on bird damage verified during site visits and from damage reported by cooperators, the economic damage associated with birds has been estimated at over $1.6 million in Maine since FY 2006 (see Table 1.2). The actual damage is likely higher since damage reported to and verified by WS is based only on those persons requesting assistance from WS.

Requests for assistance associated with natural resources and human safety can often be associated with the threat of damage. Therefore, monetary losses that were prevented from occurring by conducting damage management activities would be difficult to determine. For human safety, requests for assistance received by WS are often associated with reducing the threats of aircraft striking birds at airports. Aircraft striking birds can cause catastrophic failure of the aircraft, which has the potential to threaten passenger safety if the aircraft was unable to make a safe landing. WS has received requests previously and WS is likely continue to receive requests to reduce threats to natural resources, such as predation on threatened and endangered (T&E) species in Maine. Requests received by WS to reduce threats to T&E species arises primarily from predation on eggs and chicks from avian predators.

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

Table 1.2 – Reported or verified monetary damage by resource caused by birds in Maine

Resource	Fiscal Year						Total
	2006	2007	2008	2009	2010	2011	
Property	$644,550	$390,500	$37,600	$15,950	$34,475	$48,500	**$1,171,575**
Agriculture	$23,900	$17,650	$12,700	$28,075	$35,717	$25,755	**$143,797**
Natural Resources	$0	$0	$0	$0	$0	$0	**$0**
Human Safety	$300	$228,000	$0	$1,950	$0	$84,500	**$314,750**
Total	**$668,750**	**$636,150**	**$50,300**	**$45,975**	**$70,192**	**$158,755**	**$1,630,122**

As stated previously, the need for action arises from requests received from state, federal, and private entities to provide assistance with resolving damage or threats of damage to four main categories of resources in Maine that include agricultural resources, natural resources, property, and human safety. More specific information regarding bird damage to those main categories are discussed in the following sections of the EA:

Need to Resolve Bird Damage to Agricultural Resources

Agriculture continues to be an important sector in the Maine economy with the value of agricultural production totaling over $617 million in 2007 (USDA 2009). Agricultural production occurs on nearly 1.4 million acres of land in Maine on approximately 8,100 farms (USDA 2009). The top farm commodities for cash receipts were generated from the production of fruit, plants, and vegetables, which together accounted for over 50% of the cash receipts in the State. Cattle and calves accounted for over $15 million in cash receipts in Maine during 2007 with over $126 million in cash receipts from the production of milk (USDA 2009). The cattle and calf inventory in 2007 was estimated at over 88,000 head with hogs estimated at 4,400 individuals (USDA 2009). Cash receipts from aquaculture totaled over $26 million in 2007 (USDA 2009). The aquaculture industry in Maine raises a variety of freshwater and marine organisms including trout, salmon, oysters, clams, mussels, scallops, and urchins.

Damage to Aquaculture Resources

Damage to aquaculture resources occurs primarily from the economic losses associated with birds consuming fish and other commercially raised aquatic wildlife. Damage can also result from the death of fish and other aquatic wildlife from injuries 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 in Maine are trout, salmon, and mollusks (USDA 2009). In 2007, there were 99 commercial aquaculture facilities in Maine with nearly $26 million in sales (USDA 2009). Aquaculture products account for over 4% of the market value of agricultural products sold in Maine (USDA 2009). Of those birds shown in Table 1.1 associated with damage to agriculture, of primary concern to aquaculture facilities in Maine are the double-crested cormorant, great blue heron, osprey, and to a lesser extent waterfowl, red-tailed hawks, crows, ravens, and common grackles.

Double-crested cormorants can feed heavily on fish being raised for human consumption, and on fish commercially raised for bait and restocking (USFWS 2003, USFWS 2009*a*). 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 are rarely distributed evenly over a given region but are often 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, some aquaculture producers in a region suffer little or no economic damage from cormorants, while others experience exceptionally high losses. 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 predation concern (Glahn et al. 1999*a*). Glahn et al. (1999*a*) 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*a*). 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*b*). 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*b*).

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, American crows, common ravens, 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 fingerlings 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, ospreys were 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) and common ravens (Parkhurst et al. 1987). 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). A study conducted in Pennsylvania during 1985 and 1986 found crows consumed a mean of 11,651 trout per year per site from ten trout hatcheries (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 wildlife inside impoundments at aquaculture facilities and the high densities of those organisms in the impoundments, the introduction of a disease could result in substantial economic losses. Although 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 Vestergard-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 Vestergard-Jorgensen (1973) found the Egtved virus did not pass through the digestive tracks into the fecal droppings of black-headed gulls (*Chroicocephalus 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 that 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. 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). 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 in Maine (see Table 1.1). 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 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 can be highest during those periods when birds are concentrated into large flocks, such as during 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 cormorants, pigeons, and house sparrows. Of primary concern to livestock feedlots and dairies in Maine are wild turkeys, starlings, red-winged blackbirds, grackles, cowbirds, house sparrows, pigeons, and to a lesser extent crows. 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 starlings and blackbirds feeding on livestock rations has been documented in France and Great Britain (Feare 1984), and in the United States (Besser et al. 1968, Dolbeer et al. 1978, Glahn and Otis 1981, Glahn 1983, Glahn and Otis 1986). Diet rations for cattle contain all of the nutrients and fiber that cattle need, and are so thoroughly mixed that cattle are unable to select any single component over others. Livestock feed and rations are often formulated to ensure proper health of the animal. Higher fiber roughage in livestock feed is often supplemented with corn, barley, and other grains to ensure weight gain and in the case of dairies, for dairy cattle to produce milk. Livestock are unable to select for certain ingredients in livestock feed while birds often can selectively choose to feed on the corn, barley, and other grains formulated in livestock feed. Livestock feed provided in open troughs is most vulnerable to feeding by birds. Birds often select for those components of feed that are most beneficial to the desired outcome of livestock. When large flocks of birds selectively forage for components in livestock feeds, the composition and the energy value of the feed can be altered, which can negatively affect the health and production of livestock. The removal of this high-energy source by European starlings is believed to reduce milk yields and weight gains, which is economically critical (Feare 1984). Glahn and Otis (1986) reported that starling damage was also associated with proximity to roosts, snow, freezing temperatures, and the number of livestock on feed.

The economic significance of feed losses to starlings and blackbirds has been demonstrated by Besser et al. (1968) who concluded that the value of losses in feedlots near Denver, Colorado was $84 per 1,000 birds in 1967. Forbes (1995) reported European starlings consumed up to 50% of their body weight in feed each day. Glahn and Otis (1981) reported losses of 4.8 kg of pelletized feed consumed per 1,000 bird minutes. Glahn (1983) reported that 25.8% of farms in Tennessee experienced starling depredation problems of which 6.3% experienced considerable economic loss. 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. Carlson et al. (2010) found *Salmonella enterica* in the gastrointestinal tract of starlings at cattle feedlots in Texas and suggested starlings could contribute to the contamination of cattle feed and water. Birds feeding in open troughs on livestock feed leave fecal deposits that could 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 surface areas where livestock can encounter fecal matter deposited by birds. Many bird species, especially those encountered at livestock operations, are known to carry infectious diseases, which can be excreted in fecal matter. Accumulations of fecal matter 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. LeJeune et al. (2008) found that starlings could play a role in the transmission of *Escherichia coli* between dairy farms.

Wild and domestic waterfowl are the acknowledged natural reservoirs for a variety of avian influenza viruses (Davidson and Nettles 1997). Avian influenza (AI) circulates among those birds without clinical signs and is not an important mortality factor in wild waterfowl (Davidson and Nettles 1997). However, the potential for AI to produce devastating disease in domestic poultry makes its occurrence in waterfowl an important issue (Davidson and Nettles 1997, USDA 2008). In 2002, the commercial poultry industry in Virginia experienced losses of $130 million due to an outbreak of AI, with USDA spending an additional $17 million on response efforts and paying $154 million in indemnity to affected producers (G. Comyn, USDA-APHIS-Veterinary Services pers. comm. 2009). While Canada geese have been implicated in causing Bovine Coccidiosis in calves, the coccidia that infects cattle is a different species of coccidia than the coccidia that infects Canada geese (Doster 1998).

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

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. A number of diseases that affect livestock have been associated with rock pigeons, European starlings, and house sparrows (Weber 1979). Rock pigeons, starlings, and house sparrows have been identified as carriers of several bacteria that are known to cause diseases in livestock and pets, including erysipeloid, salmonellosis, pasteurellosis, avian tuberculosis, streptococcosis, vibrosis, and listeriosis (Weber 1979, Carlson et al. 2010). Weber (1979) also reported pigeons, starlings, and house sparrows as vectors of several viral, fungal, protozoal, and rickettsial diseases that are known to infect livestock and pets.

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 Statistics Service (NASS) reported livestock owners lost 11,900 head of cattle and calves from vultures in the United States during 2010 valued at $4.6 million (NASS 2011). Vulture predation on livestock is distinctive. Vultures kill pigs by pulling their eyes out followed by attacks to the rectal area or directly attacking the rectal area (Lovell 1947, Lovell 1952, Lowney 1999). During a difficult delivery, vultures will peck at the half-expunged calf and kill it.

Economic losses can also result from raptors, particularly red-tailed hawks, feeding on domestic fowl, such as chickens and waterfowl. Free-ranging fowl or fowl allowed to range outside of confinement are particularly vulnerable to predation by raptors.

Damage to Agricultural Crops

Besser (1985) estimated damage to agricultural crops associated with birds exceeded $100 million annually in the United States. Bird damage to agricultural crops occurs primarily from the consumption of crops (*i.e*., loss of the crop and revenue), but also consists of trampling of emerging crops by waterfowl, damage to fruits associated with feeding, and fecal contamination. In 2006, cash receipts from wild blueberries accounted for over 10% of the cash receipts from all agricultural commodities (crop and livestock) in Maine, which was second behind potatoes in total cash receipts for all agricultural crops (New England Agricultural Statistics 2012). Other crop commodities harvested in 2006 including barley, oats, sweet corn, apples, cranberries, and other fruits and vegetables (New England Agricultural Statistics 2012). Damage to agricultural crops in Maine occurs primarily from wild turkeys, Canada geese, American crows, starlings, red-winged blackbirds, grackles, cowbirds, house sparrows, and to a lesser extent mallards, woodpeckers, ravens, and American robins. Starlings feed on numerous types of fruits such as, cherries, figs, blueberries, apples, apricots, grapes, nectarines, peaches, plums, persimmons, strawberries, and olives (Weber 1979). Wildlife damage to apples, grapes, and blueberries has been estimated at $41 million annually, with most of the damage attributed to birds (USDA 1999).

Fruit and nut crops can be damaged by crows, robins, starlings, red-winged blackbirds, grackles, cowbirds, and American crows. Besser (1985) estimated bird damage to grapes, cherries, and blueberries 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 or from knocking the berries from the bushes (Besser 1985). During a survey conducted in 15 states and British Columbia, Avery et al. (1992) found that 84% of respondents to the survey considered bird damage to blueberries to be "*serious*" or "*moderately serious*". Respondents of the survey identified starlings, robins, and grackles as the primary cause of damage (Avery et al. 1992). Avery et al. (1992) estimated bird damage to blueberry production in the United States cost growers $8.5 million in 1989.

Damage to apples can occur from beak punctures, which makes the apples unmarketable (Besser 1985). Crows, robins, and starlings 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 apples is likely localized in Maine and infrequently reported.

Bird damage to sweet corn can also result in economic losses to producers with damage often amplified since damage to sweet corn caused by birds makes the ear of corn unmarketable because 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 and starlings (Besser 1985). Damage occurs when birds rip or pull back the husk exposing the ear for consumption. Most bird damage occurs during the development stage known as the milk and dough stage when the kernels are soft and filled with a milky liquid. 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, common ravens, and Canada geese are known to cause damage to sprouting corn (Stone and Mott 1973). Additionally, starlings may pull sprouting grains and feed on planted seed (Johnson and Glahn 1994). Damage to sprouting corn is likely localized and highest in areas where breeding colonies of grackles exist in close proximity to agricultural fields planted with corn (Stone and Mott 1973, Rogers and Linehan 1977). Rogers and Linehan (1977) found grackles damaged two corn sprouts per minute on average when present at a field planted near a breeding colony of grackles.

A single intense grazing event by Canada geese in fall, winter, or spring can reduce the yield of winter wheat by 16% to 30% (Fledger et al. 1987), and reduce growth of rye plants by more than 40% (Conover 1988). However, some research has reported that grazing by geese during the winter may increase rye or wheat seed yields (Clark and Jarvis 1978, Allen et al. 1985).

The most common waterfowl damage to agriculture is crop consumption, but also consists of unacceptable accumulations of feces on pastures, trampling of emerging crops, and increased erosion and runoff from fields where the cover crop has been grazed. Waterfowl graze a variety of crops, including oats, wheat, corn, soybeans, and alfalfa. Since 1985, agricultural practices have changed resulting in intensive wheat growing practices with much higher yields of approximately 100 bushels per acre, but these crops are unable to sustain even light grazing pressure without losing yield. Associated costs with agricultural damage involving waterfowl include costs to replant grazed crops (*e.g*., soybeans, corn), implement wildlife management practices, purchase replacement food sources, and decreased yields.

Need to Resolve Threats that Birds Pose to Human Safety

Several bird species listed in Table 1.1 can be closely associated with human habitation and often exhibit gregarious behavior (*i.e*., found together in large numbers), such as vultures, waterfowl, crows, ravens, turkeys, starlings, pigeons, house sparrows, 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 were struck by aircraft, excessive droppings can be aesthetically displeasing, and aggressive behavior, primarily from geese, waterfowl, and raptors, can pose risks to human safety.

Threat of Disease Transmission

Birds can play a role in the transmission of diseases where humans may encounter 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 (Clark and McLean 2003). Study of this issue is complicated by the fact that some disease-causing agents associated with birds may also be contracted from other sources. For example, elevated fecal coliform counts in water along a public swimming area could have originated from geese using the swimming area or could have originated from sewage leaking into the water from nearby sewer lines.

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 a role in the transmission of zoonotic diseases to humans such as encephalitis, West Nile Virus, psittacosis, and histoplasmosis. Public health officials and residents at such sites express concerns for human health related to the potential for disease transmission where fecal droppings accumulate. 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 people (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. For example, workers at an ethanol plant in eastern Nebraska became ill with Histoplasmosis after breathing in spores from construction in an area that had a starling roost (Mortality and Morbidity Weekly Report 2004). Ornithosis (*Chlamydia psittaci*) is another respiratory disease that can be contracted by humans, livestock, and pets. Pigeons are most commonly associated with the spread of Ornithosis to humans. Ornithosis is a virus that is spread through infected bird droppings when viral particles become airborne after infected bird droppings are disturbed.

As many as 65 different diseases transmittable to humans or domestic animals have been associated with pigeons, European starlings, and house sparrows (Weber 1979). In most cases, in which human health concerns are a major reason for requesting assistance, no actual cases of bird transmission of disease to humans have been proven to occur. Thus, the risk of disease transmission would be the primary reason people request assistance.

Waterfowl may affect human health through the distribution and incubation of various pathogens and through nutrient loading. For instance, a foraging Canada goose defecates between 5.2 and 8.8 times per hour (Bedard and Gauthier 1986). Kear (1963) recorded a maximum fecal deposition rate for Canada geese of 0.39 pounds per day (dry weight). Public swimming beaches, private ponds, and lakes can be affected by goose droppings. There are several pathogens involving waterfowl which may be contracted by humans; however, the Centers for Disease Control and Prevention (CDC) considers the risk of infection to be low (CDC 1998). The primary route of infection would be through incidental contact with contaminated material. Direct contact with fecal matter would not likely be a route of transmission of waterfowl zoonoses unless ingested directly. Although intentional contact with feces is not likely, transmission can occur when people unknowingly contact and ingest contaminated material. Therefore, the risk to human health from waterfowl zoonoses is low and a direct link of transmission from waterfowl to humans can be difficult to determine. Linking the transmission of diseases from waterfowl to people is especially difficult since many pathogens occur naturally in the environment and pathogens can be attributed to contamination from other sources. However, the presence of disease causing organisms in waterfowl feces can increase the risk of exposure and transmission of zoonoses wherever people may encounter large accumulations of feces from waterfowl. Flemming et al. (2001) reviewed the impacts of Canada geese on water quality and identified a number of hazards that geese pose. The USFWS has documented threats to public health from geese and authorized the issuance of depredation permits or orders to reduce those threats, which were addressed in the Final Environmental Impact Statement (FEIS) evaluating the management of resident goose populations (USFWS 2005).

Cryptosporidiosis is a disease caused by the parasite *Cryptosporidium parvum*, which was not known to cause illness in people until 1976 (CDC 1998). A person can be infected by drinking contaminated water or by direct contact with the fecal droppings of infected animals (CDC 1998). Exposure can occur from swimming in lakes, ponds, streams, and pools, and from swallowing water while swimming (Colley 1996). *Cryptosporidium* can cause gastrointestinal disorders (Virginia Department of Health 1995) and can produce life-threatening infections, especially in people with compromised or suppressed immune systems (Roffe 1987, Graczyk et al. 1998). Cryptosporidiosis has been recognized as a disease with implications for human health (Smith et al. 1997). Canada geese in Maryland were shown to disseminate infectious *Cryptosporidium parvum* oocysts in the environment (Graczyk et al. 1996). Kassa et al. (2001) found that *Cryptosporidium* was the most common infectious organism found in 77.8% of goose fecal samples from sites comprised primarily of parks and golf courses, indicating that occupational exposure to this pathogen is very plausible although the risk to humans is relatively low.

Giardiasis (*Giardia lambia*) is an illness caused by a microscopic parasite that can infect mammals and birds (Kuhn et al. 2002). Giardiasis has become recognized as one of the most common causes of waterborne disease in people across the United States during the last 15 years (CDC 1999). Giardiasis is contracted by swallowing contaminated water or putting anything in your mouth that has touched the stool of an infected animal or person. Symptoms of giardiasis include diarrhea, cramps, and nausea (CDC 1999). Canada geese in Maryland were shown to disseminate infectious *Giardia* spp. cysts in the environment (Graczyk et al. 1998). Kassa et al. (2001) also found *Giardia* spp. in goose feces at numerous urban sites.

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, but it can also affect Canada geese. Avian botulism is the most common disease of waterfowl. Increased numbers of Canada geese using recreational areas increases the risk to the pubic (McLean 2003).

Salmonella (*Salmonella* spp.) may be contracted by humans by handling materials soiled with bird feces (Stroud and Friend 1987). Salmonella has been isolated from the gastrointestinal tract of starlings (Carlson et al. 2010). Salmonella causes gastrointestinal illness, including diarrhea.

Swimmer's itch (*Cercarial dermatitis*) occurs from an inflammatory immune reaction in people when water-borne microscopic schistosome parasites burrowing into their skin. Allergic reactions typically manifest in the form of a skin rash and can be extremely itchy. Generally, symptoms of swimmer's itch do not occur for more than a week. These microscopic parasites complete a life cycle using both snails and vertebrate hosts, primarily water birds. Once released from infected snails into fresh and salt water, the parasites generally seek out water birds, including mergansers, to complete their life cycles (CDC 2012).

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).

Campylobacteriosis is an infectious disease caused by bacteria of the genus *Campylobacter*. In persons with compromised immune systems, *Campylobacter* occasionally spreads to the bloodstream and causes a serious life-threatening infection, but normally causes diarrhea and is one of the most common diarrhea illnesses in the United States (CDC 2007). Canada geese have been found to be a carrier of *Campylobacter* and can spread the bacteria in their feces (Kassa et al. 2001). In a study involving geese conducted in the United Kingdom, Colles et al. (2008) concluded that geese could not be excluded as a source of campylobacteriosis in people; however, the contribution of geese to campylobacteriosis outbreaks was likely to be minor.

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). The serological type of *E. coli* that is best known is *E. coli* O157:H7, which is usually associated with cattle (Gallien and Hartung 1994). Recent research has demonstrated that Canada geese can disseminate *E. coli* into the environment, which can elevate fecal coliform densities in the water column (Hussong et al. 1979, Alderisio and DeLuca 1999, Cole et al. 2005). 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 often temporarily closed, which can adversely affect the enjoyment of those areas by the public, even though the serological type of the *E. coli* is unknown. Unfortunately, linking the elevated bacterial counts to the frequency of waterfowl use and attributing the elevated levels to human health threats has been problematic until recently. Advances in genetic engineering have allowed microbiologists to match genetic code of coliform bacteria to specific animal species and link those animal sources of coliform bacteria to fecal contamination (Simmons et al. 1995, Jamieson 1998). For example, Simmons et al. (1995) used genetic fingerprinting to link fecal contamination of small ponds on Fisherman Island, Virginia to waterfowl. Microbiologists were able to implicate waterfowl and gulls as the source of fecal coliform bacteria at the Kensico Watershed, a water supply for New York City (Klett et al. 1998, Alderisio and DeLuca 1999). In addition, fecal coliform bacteria counts coincided with the number of Canada geese and gulls roosting at the reservoir. Cole et al. (2005) found that geese might serve as a vector of antimicrobial resistance genes, indicating that they not only harbor and spread zoonotic diseases like *E. coli* but also may spread strains that are resistant to current control measures. Starlings were also found to potential sources of *E. coli* at dairy farms and had the potential to transport *E. coli* to other areas (LeJeune et al. 2008).

Roscoe (1999) conducted a survey to estimate the prevalence of pathogenic bacteria and protozoa in resident Canada geese in New Jersey and found no *Salmonella* spp., *Shigella* spp., or *Yersinia* spp. isolated from any of the 500 Canada goose samples. However, Roscoe (1999) did report finding *Cryptosporidium* spp. in 49 (10%) of the 500 geese, and *Giardia* spp. in 75 (15%) of the geese. Additionally, the United States Geological Survey (USGS) conducted field studies in New Jersey, Virginia, and Massachusetts to determine the presence of organisms that could cause disease in humans exposed to feces of Canada geese at sites with a history of high public use and daily use by geese (USGS 2000). *Salmonella* spp., *Listeria* spp., *Chlamydia* spp., and *Giardia* spp. were isolated from goose feces in New Jersey (USGS 2000).

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, Clark and McLean 2003). In worst-case scenarios, infections may even be life threatening for people with compromised or suppressed immune systems (Roffe 1987, Graczyk et al. 1998). Even though many people are concerned about disease transmission from feces, the probability of contracting disease from feces is believed to be small. However, human exposure to fecal droppings through direct contact or through the disturbance of accumulations of fecal droppings where disease organisms are known to occur increases the likelihood of disease transmission. Canada geese, starlings, and blackbirds are closely associated with human habitation and they often exhibit gregarious roosting behavior. This gregarious behavior can lead to accumulations of fecal droppings that could 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 people may come in direct contact with fecal droppings. 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. 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 methods to reduce transmission risks.

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 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 leading to crashes. In several instances, wildlife-aircraft collisions in the United States have resulted in human fatalities. In 1995, a Boeing 707 E38 AWACS jet taking off from Elmendorf Air Force Base in Alaska ingested at least 13 geese into the number 1 and 2 engines and crashed, killing all 24 crewmembers (Dolbeer 1997). The risk that birds pose to aircraft is well documented with the worst case reported in Boston in 1960 when 62 people were killed in the crash of an airliner that collided with a flock of European starlings (Terres 1980).

Since 1988, more than 229 people worldwide have died in aircraft that have crashed after striking wildlife (Dolbeer et al. 2012). Between 1990 and 2010, 24 people have died after commercial or private aircraft have stuck birds in the United States (Dolbeer et al. 2012). Of those 24 fatalities involving bird strikes, seven fatalities occurred after striking birds that were not identified while eight fatalities occurred after strikes involving red-tailed hawks (Dolbeer et al. 2012). A recent example occurred in Oklahoma where an aircraft struck American white pelicans (*Pelecanus erythrorhynchos*) causing the plane to crash killing all five people aboard (Dove et al. 2009). Injuries can also occur to pilots and passengers from bird strikes. Between 1990 and 2010, 44 strikes involving waterfowl have resulted in injuries to 49 people, while 29 strikes involving vultures resulted in injuries to 32 people (Dolbeer et al. 2012).

Additional Human Safety Concerns Associated with Birds

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

In addition to raptors, waterfowl can also aggressively defend their nests and nestlings during the nesting season. Waterfowl aggressively defend their nests, nesting areas, and young, and may attack or threaten pets, children, and adults (Smith et al. 1999). Feral waterfowl often nest in high densities in areas used by people, such as industrial areas or recreational areas (*e.g*., parks, beaches, and sports fields) (VerCauteren and Marks 2004). If people unknowingly approach waterfowl or their nests at those locations, injuries could occur if waterfowl react aggressively to the presence of those people or their pets. Additionally, slipping hazards can be created by the buildup of feces from birds on docks, walkways, and other foot traffic areas. If fecal droppings occur in areas with foot traffic, slipping could occur resulting in injuries to people. To avoid those conditions, regular clean up is often required to alleviate threats of slipping on fecal matter, which can be economically burdensome.

Need to Resolve Bird Damage Occurring to Property

As shown in Table 1.1, all the bird species addressed in this assessment are known to cause damage to property in Maine. 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 can also cause direct damage to property by excavating holes in buildings. Woodpeckers can excavate holes in buildings to create nesting cavities, which can remove insulation and allows water and other wildlife to enter the building. In addition, woodpeckers often excavate holes in search of insects that may live inside the wood siding of buildings. 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.

Property Damage to Aircraft from Bird Strikes

Target bird species can present a safety threat to aviation when those species occur in areas on and around airports. Species of birds that occur in large flocks or flight lines entering or exiting a roost at or near airports or when present in large flocks foraging on airport property can result in aircraft strikes involving several individuals of a bird species, which can increase damage and increase the risks of catastrophic failure of the aircraft. Vultures and raptors can also present a risk to aircraft because of their large body mass and slow-flying or soaring behavior. Vultures are considered the most hazardous bird for an aircraft to strike based on the frequency of strikes, effect on flight, and amount of damage caused by vultures throughout the country (Dolbeer et al. 2000).

From 1990 through 2010, 105,947 bird strikes have been reported to the Federal Aviation Administration (FAA) in the United States or to air carriers in the United States (Dolbeer et al. 2012). The number of actual bird strikes is likely to be much greater since an estimated 80% of civil bird strikes may go unreported (Linnell et al. 1999, Cleary et al. 2005, Wright and Dolbeer 2005). Between 2004 and 2008, Dolbeer (2009) estimated that 39% of aircraft strikes were reported to the FAA. Nearly 95% of the reported aircraft strikes in Maine have involved birds (Dolbeer et al. 2012). In Maine, aircraft strikes have been reported with crows, kestrels, bald eagles, grackles, ravens, starlings, great blue herons, mallards, northern harriers, pigeons, Canada geese, ospreys, and red-tailed hawks (FAA 2012). In total, 155 wildlife strikes have been reported with unknown birds in Maine from January 1990 to December 2012 (FAA 2012). Generally, bird collisions occur when aircraft are near the ground during take-off and approach to the runway. From 1990 through 2010, approximately 76% of reported bird strikes to general aviation aircraft in the United States occurred when the aircraft was at an altitude of 500 feet above ground level or less. Additionally, approximately 97% occurred less than 3,500 feet above ground level (Dolbeer et al. 2012).

Gulls, pigeons/doves, raptors, and waterfowl are the bird groups most frequently struck by aircraft in the United States (Dolbeer et al. 2012). Of the total known birds struck in the United States from 1990 through 2010, gulls comprised 17% of the strikes, pigeons and doves comprised 15% of the total reported strikes where identification occurred, while raptors accounted for 13%, and waterfowl were identified in 7% of reported strikes (Dolbeer et al. 2012). When struck, 27% of the reported gull strikes resulted in damage to the aircraft or had a negative effect on the flight while 66% of the reported waterfowl strikes resulted in damage or negative effects on the flight (Dolbeer et al. 2012). Since 1990, nearly $151 million in damages to civil aircraft have been reported from strikes involving waterfowl (Dolbeer et al. 2012). In total, aircraft strikes involving birds has resulted in 448,138 hours of aircraft downtime and over $394.4 million in reported damages to civil aircraft since 1990 in the United States (Dolbeer et al. 2012).

Nationally, the resident Canada goose population probably represents the single most serious bird threat to aircraft safety (Alge 1999, Suebert and Dolbeer 2004, Dolbeer and Seubert 2006). Resident Canada geese are of particular concern to aviation because of their large size (typically 8 to 15 pounds, which exceeds the four pound bird certification standard for engines and airframes); flocking behavior (which increases the likelihood of multiple bird strikes); attraction to airports for grazing; and year-around presence in urban environments near airports (Seubert and Dolbeer 2004). From 1990 through 2010, there have been 1,296 reported strikes involving Canada geese in the United States, resulting in nearly $89 million in damages and associated costs to civil aircraft (Dolbeer et al. 2012). The threat that Canada geese pose to aircraft safety was dramatically demonstrated in January 2009 when US Airways Flight 1549 made an emergency landing in the Hudson River after ingesting multiple Canada geese into both engines shortly after takeoff from New York LaGuardia Airport (Wright 2010, Dolbeer et al. 2012). Although the aircraft was destroyed after sinking in the river, all 150 passengers and five crew members survived (Wright 2010). In addition to civil aviation, the United States Air Force (USAF) reports that Canada geese have caused nearly $93 million in damage to aircraft and have been involved in 139 strikes since the beginning of their recording period through December 2009, averaging over $669,000 in damages per strike (USAF 2010).

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 they 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 transport industry as a whole (Conover et al. 1995). From 1990 through 2010, 308 birds have been reported as struck by aircraft in Maine (Dolbeer et al. 2012).

Additional Property Damage Associated with Birds

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*., found together in large numbers) especially during the fall and spring migration periods. Although damage and threats can occur throughout the year, damage can be 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.

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 can result 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. Cormorants, herons, and grackles often nest in large colonies. Canada geese, feral waterfowl, rock pigeons, and house sparrows can also nest together in large numbers.

Property losses associated with cormorants include impacts to privately owned lakes that are stocked with fish; damage to boats and marinas or other properties found near cormorant breeding or roosting sites; and damage to vegetation on privately owned land (USFWS 2003).

Waterfowl may cause damage to aircraft, landscaping, piers, yards, boats, beaches, shorelines, parks, golf courses, driveways, athletic fields, ponds, lakes, rafts, porches, patios, gardens, footpaths, swimming pools, playgrounds, school grounds, and cemeteries (USFWS 2005). Property damage can involve goose fecal matter that pollutes and contaminates landscaping and walkways, often at golf courses and water front property, or grazing damage to landscaping and turf. Businesses may be concerned about the negative aesthetic appearance of their property caused by excessive droppings and excessive grazing, and are sensitive to comments by clients and guests. Costs associated with property damage include labor and disinfectants to clean and sanitize fecal droppings, implementation of methods to reduce the presence of waterfowl, loss of property use, loss of aesthetic value of flowers, gardens, and lawns consumed by waterfowl, loss of customers or visitors irritated by walking in fecal droppings, repair of golf greens, and replacing grazed turf. The costs of reestablishing overgrazed lawns and cleaning waterfowl feces from sidewalks has been estimated at more than $60 per bird (Conover 1991, Allan et at. 1995).

Need for Waterfowl Damage Management to Prevent Damage and Threats to Natural Resources

Birds can also negatively affect natural resources through habitat degradation, competition with other wildlife, and through direct depredation on natural resources. Habitat degradation can occur when large concentrations of birds in a localized area negatively affect characteristics of the surrounding habitat, which 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 T&E species.

Habitat degradation in Maine 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. Over time, 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. For example, ammonium toxicity from fecal droppings of cormorants 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 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 effect 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). For example, 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 29 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 effect on many species, some colonial waterbirds such as pelicans and terns prefer sparsely vegetated substrates.

As the population of double-crested cormorants has increased, so has concern for sport fishery populations (USFWS 2003). Cormorants can have a negative effect on recreational fishing on a localized level (USFWS 2003). Recreational fishing benefits local and regional economies in many areas of the United States, with some local economies relying heavily on income associated with recreational fisheries (USFWS 2003). The collapse of sport fisheries can have negative economic impacts on businesses and can result in job losses (Shwiff and DeVault 2009).

The health of a lake's fishery can have an effect on the economies surrounding that lake. For example, when the walleye (*Sander vitreus*) and yellow perch (*Perca flavescens*) fishery collapsed on Oneida Lake in New York after the colonization of the lake by cormorants (VanDeValk et al. 2002, Rudstam et al. 2004), research biologists with the National Wildlife Research Center (NWRC) sought to identify the actual monetary damage associated with the declines of those sport fish populations. The total estimated revenue lost in the Oneida Lake region from 1990 to 2005 due to declines in the sport fisheries on the lake ranged from $122 million to $539 million. That lost revenue from the collapse of the fisheries resource resulted in the loss of 3,284 to 12,862 jobs in the Oneida Lake region from 1990 to 2005 (Shwiff and DeVault 2009). In 1998, the WS program in New York was requested to assist with managing damage associated with cormorants on Oneida Lake. Cormorant damage management activities conducted on Oneida Lake from 1998 to 2005 prevented the loss of an estimated $48 million to $171 million in revenue, which allowed between 1,446 and 5,014 jobs to be retained in the Oneida Lake region (Shwiff and DeVault 2009).

The degree to which cormorant predation affects sport fishery populations in a given body of water is dependent on a number of variables, including the number of birds present, the time of year at which predation is occurring, prey species composition, and physical characteristics such as depth or proximity to shore (which affect prey accessibility). In addition to cormorant predation, environmental and human-induced factors affect aquatic ecosystems. Those factors can be classified as biological/biotic (*e.g.*, overexploitation, exotic species), chemical (*e.g.*, water quality, nutrient and contaminant loading), or physical/abiotic (*e.g.*, dredging, dam construction, hydropower operation, siltation). Such activities may lead to changes in species density, diversity, and/or composition due to direct effects on year class strength, recruitment, spawning success, spawning or nursery habitat, and/or competition (USFWS 1995).

Large accumulations of fecal droppings under crow roosts could be detrimental to 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).

Nutrient loading has been found to increase in wetlands in proportion to increases in the numbers of roosting geese (Manny et al. 1994, Kitchell et al. 1999). In studying the relationship between bird density and phosphorus and nitrogen levels in Bosque Del Apache National Wildlife Refuge in New Mexico, Kitchell et al. (1999) found an increase in the concentration of both phosphorus and nitrogen correlated with an increase in bird density. 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; therefore, the phosphorus from waterfowl feces was considered a form of internal loading. Waterfowl can contribute substantial amounts of phosphorus and nitrogen into lakes through feces, which can cause excessive aquatic macrophyte growth and algae blooms (Scherer et al. 1995) and accelerated eutrophication through nutrient loading (Harris et al. 1981).

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).

Interspecific nest competition has been well documented in European starlings. European starlings compete aggressively for nesting sites and they have been found to take over nesting cavities of native birds. Miller (1975) and Barnes (1991) reported European starlings were responsible for a severe depletion of the eastern bluebird (*Sialia sialis*) population due to nest competition. Nest competition by European starlings has also been known to adversely affect American kestrels (Von Jarchow 1943, Nickell 1967, Wilmer 1987), red-bellied woodpeckers (*Centurus carolinus*), Gila woodpeckers (*Centurus uropygialis*) (Kerpez and Smith 1990, Ingold 1994), northern flickers (*Colaptes auratus*), purple martins (*Progne subis*) (Allen and Nice 1952), and wood ducks (*Aix sponsa*) (Shake 1967, McGilvery and Uhler 1971, Grabill 1977, Heusmann et al. 1977). Weitzel (1988) reported nine native species of birds in Nevada that had been displaced by starling nest competition, and Mason et al. (1972) reported European starlings evicting bats from nest holes.

House sparrows can out-compete native species for nesting sites, destroying their eggs, killing nestlings, and establish year round territories, which prevent late arriving species like Eastern bluebirds and tree swallows from nesting (Cornell News 2004).

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. 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 (*Charadrius melodus*) eggs and nestlings. Piping plovers are currently considered a threatened species by the USFWS and an endangered species in the State by the MDIFW.

1.3 SCOPE OF THIS ENVIRONMENTAL ASSESSMENT

Actions Analyzed

This EA evaluates the need for bird damage management to reduce threats to human safety and to resolve damage to property, natural resources, and agricultural resources on federal, state, tribal, municipal, and private land within the State of Maine, wherever such management is requested by a cooperator. This EA discusses the issues associated with conducting damage management activities in the State to meet the need for action and evaluates different alternatives to meet that need while addressing those issues. In addition, this EA evaluates the permitting of bird take through the issuance of depredation permits by the USFWS to WS and to other entities within the State.

The methods available for use to manage bird damage are discussed in Appendix B. The alternatives and Appendix B also discuss how methods would be employed to manage damage and threats associated with birds. Therefore, the actions evaluated in this EA are the use of those methods available under the alternatives and the employment of those methods by WS to manage or prevent damage and threats associated with birds from occurring when permitted by the USFWS pursuant to the MBTA.

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

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

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

Period for which this EA is Valid

If the analyses in this EA indicates an Environmental Impact Statement (EIS) is not warranted, this EA would remain valid until WS and the USFWS 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 would be reviewed and if appropriate, supplemented pursuant to the NEPA. Review of the EA would be conducted to ensure that activities conducted under the selected alternative occur within the parameters evaluated in the EA. If the alternative analyzing no involvement in bird damage management activities by WS were selected, no additional analyses by WS would occur based on the lack of involvement by WS. The monitoring of activities by WS and the USFWS would ensure the EA remained appropriate to the scope of activities conducted by WS and the USFWS under the selected alternative.

Site Specificity

Actions could be taken to reduce threats to human health and safety, reduce damage to agricultural resources, alleviate property damage, and protect native wildlife, including T&E species, in the State. As mentioned previously, WS would only conduct damage management activities when requested by the appropriate property owner or manager. In addition, WS' activities that could involve the lethal removal of birds under the alternatives would only occur when permitted by the USFWS, when required, and only at levels permitted.

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

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

Chapter 2 of this EA identifies and discusses issues relating to bird damage management in Maine. The standard WS Decision Model (Slate et al. 1992) would be the site-specific procedure for individual actions conducted by WS in the State (see Chapter 3 for a description of the Decision Model and its application). Decisions made using the model would be in accordance with WS' directives[7] and Standard Operating Procedures (SOPs) described in this EA as well as relevant laws and regulations.

The analyses in this EA are intended to apply to any action that may occur in any locale and at any time within Maine. In this way, WS and the USFWS believes it meets the intent of the NEPA with regard to site-specific analysis and that this is the only practical way for WS and the USFWS to comply with the NEPA and still be able to address damage and threats associated with birds.

Native American Lands and Tribes

The WS program in Maine would only conduct damage management activities when requested by a Native American Tribe. Activities would only be conducted after a MOU or cooperative service agreement had been signed between WS and the Tribe requesting assistance. Therefore, the Tribe would determine when WS' assistance was required and what activities would be allowed. Because Tribal officials would be responsible for requesting assistance from WS and determining what methods would

[7]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.

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

Federal, State, County, City, and Private Lands

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

Summary of Public Involvement

Issues related to bird damage management and the alternatives to address those issues were initially developed by an interagency team comprised of personnel from WS and the USFWS with review from the MDIFW. Issues were defined and preliminary alternatives were identified through the interagency team. As part of this process, and as required by the Council on Environmental Quality (CEQ) and the NEPA implementing regulations of APHIS, this document will be noticed to the public for review and comment. This EA will be noticed to the public through legal notices published in local print media, through direct mailings to interested parties, and by posting the EA on the APHIS website at http://www.aphis.usda.gov/wildlife_damage/nepa.shtml.

WS and the USFWS will make the EA available for a minimum of 30 days for the public and interested parties to provide new issues, concerns, and/or alternatives. Through the public involvement process, WS, along with the USFWS, 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 identified after publication of notices announcing the availability of the EA will be fully considered to determine whether the EA should be revisited and, if appropriate, revised prior to issuance of a final decision. New issues or alternatives identified from the public involvement process will be fully considered prior to reaching a decision on this EA.

1.4 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 that evaluated the management of double-crested cormorants (USFWS 2003). WS was a formal cooperating agency during the preparation of the FEIS. WS has adopted the FEIS to support program decisions for its involvement in the management of cormorant damage. WS completed a Record of Decision (ROD) on November 18, 2003 (see 68 FR 68020).

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

Final Environmental Impact Statement: Resident Canada Goose Management in the United States. The USFWS has issued a FEIS addressing the need for and potential environmental impacts associated with managing resident Canada goose populations (USFWS 2005). The FEIS also contains detailed analyses of the issues and methods used to manage Canada goose damage. A ROD and Final Rule were published by the USFWS on August 10, 2006 (71 FR 45964- 45993). On June 27, 2007, WS issued a ROD and adopted the FEIS (72 FR 35217).

***Gull Damage Management Environmental Assessment*:** WS has also developed an EA that analyzes the need for action to manage damage associated with herring gulls, ring-billed gulls, great black-backed gulls, and laughing gulls. The EA identified the issues associated with managing damage associated with gulls in the State and analyzed alternative approaches to meet that need while addressing the identified issues (USDA 2010). Based on the analyses in the EA, a Decision and FONSI were signed on September 24, 2010, which selected the proposed action alternative. The proposed action alternative addressed the implementation of an adaptive approach to managing damage using multiple methods that would be integrated together to meet the need for action.

Reducing the Effects of Predation on Threatened and Endangered Birds in the State of Maine Environmental Assessment: WS has also developed an EA that analyzes the need for action to resolve or prevent predation on nesting native bird populations on coastal islands and beaches associated with several species of nest predators (USDA 2012). The EA evaluates activities conducted by WS to manage predation and the threat of predation on federal and state-listed T&E species. Based on the analyses in the EA, a Decision and FONSI were signed on January 28, 2013, which selected the proposed action alternative. The proposed action alternative addressed the implementation of an adaptive approach to managing predation risks using multiple methods that would be integrated together to meet the need for action. Nest predators identified in the EA included American crows and American kestrels (USDA 2012). American crows and American kestrels are known nest predators in Maine but are known to cause damage to other resources. Therefore, to ensure a cumulative evaluation occurs, activities associated with reducing nest predation and alleviating damage to other resources caused by crows and kestrels were addressed in the nest predator EA (USDA 2012) and will be addressed in this EA.

***Reducing Pigeon, Starling, Sparrow, Blackbird, Raven and Crow Damage Environmental Assessment*:** WS previously developed an EA that addressed WS' activities to manage damage associated with rock pigeons, European starlings, house sparrows, blackbirds, ravens, and crows in the State (USDA 2001*a*). Based on the analyses in that EA, a Decision and Finding of No Significant Impact was signed by WS selecting the proposed action alternative. The proposed action alternative implemented a damage management program using a variety of methods in an integrated approach (USDA 2001*a*). Changes in the need for action and the affected environment have prompted WS to initiate this new analysis to address bird damage in the State. This EA will address more recently identified changes and will assess the potential environmental impacts of program alternatives based on a new need for action. Since activities conducted under the previous EA will be re-evaluated under this EA to address the new need for action and the associated affected environment, the previous EA that addresses bird damage will be superseded by this analysis and the outcome of the Decision issued based on the analyses in this EA.

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 a FONSI was issued for the preferred alternative in the EA (USFWS 2009*b*).

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

1.5 AUTHORITY OF FEDERAL AND STATE AGENCIES

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

WS' Legislative Authority

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

United States Fish and Wildlife Service Authority

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

The USFWS is responsible for managing and regulating take of bird species that are listed as migratory under the MBTA and those species 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 migratory birds. Under depredation orders, lethal removal can occur when those bird species are causing damage or when those species are 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 former 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 avicides and repellents available for use to manage bird damage.

Maine Department of Inland Fisheries and Wildlife

The MDIFW has authority in wildlife management given under Maine Revised Statutes Annotated Title 12. The legislation covers general provisions; licenses, permits and stamps; wildlife; fish; wild animals and T&E species. The MDIFW also has authority to conduct conservation actions for federally listed T&E species under a cooperative agreement with the USFWS. The MDIFW is responsible for preserving, protecting, and enhancing the inland fisheries and wildlife resources of the State.

Maine Department of Agriculture Board of Pesticides Control (MDABPC)

The MDABPC carries out the day-to-day responsibilities of regulating pesticides in the State of Maine and helps to protect people and the environment by ensuring the safe and appropriate use of pesticides. The main goal of the MDABPC is to prevent adverse human health or environmental effects from the misuse of pesticides. The MDABPC is responsible for enforcing all pesticide regulations and laws, both state and federal. It is responsible for carrying out provisions of the Maine Pesticide Control Act. These responsibilities include the registration of pesticides, controlling the pesticide products being used in the State, certification of pesticide applicators and enforcement of pesticide use as specified on labels. Through cooperative agreements with the EPA, the department also implements provisions of the FIFRA.

1.6 COMPLIANCE WITH LAWS AND STATUTES

Several laws or statutes authorize, regulate, or otherwise would affect the activities of WS and the USFWS. WS and the USFWS would comply with those laws and statutes and consults with other agencies as appropriate. WS would comply with all applicable federal, State, and local laws and regulations in accordance with WS Directive 2.210. Those laws and regulations relevant to managing bird damage in the State are addressed below:

National Environmental Policy Act

All federal actions are subject to the NEPA (PL 9-190, 42 USC 4321 et seq.). WS and the USFWS follow the CEQ regulations implementing the NEPA (40 CFR 1500 et seq.). In addition, WS follows USDA (7 CFR 1b) and APHIS Implementing Guidelines (7 CFR 372) as part of the decision-making process. Those laws, regulations, and guidelines generally outline five broad types of activities to be accomplished as part of any project: public involvement, analysis, documentation, implementation, and monitoring. The NEPA also sets forth the requirement that all major federal actions be evaluated in terms of their potential to significantly affect the quality of the human environment for the purpose of avoiding or, where possible, mitigating and minimizing adverse impacts. Federal activities affecting the physical and biological environment are regulated in part by the CEQ through regulations in 40 CFR 1500-1508. In accordance with the CEQ and USDA regulations, APHIS guidelines concerning the implementation of the NEPA, as published in the Federal Register (44 CFR 50381-50384), provide guidance to WS regarding the NEPA process.

Pursuant to the NEPA and the CEQ regulations, this EA documents the analyses of potential federal actions, informs decision-makers and the public of reasonable alternatives that could be capable of avoiding or minimizing adverse effects, 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 alternatives. The direct, indirect, and cumulative impacts of the proposed action are analyzed.

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

The MBTA makes it unlawful to pursue, hunt, take, capture, kill, possess, import, export, transport, sell, purchase, barter, or offer for sale, purchase, or barter, any migratory bird, or their parts, nests, or eggs (16 USC 703-711). A list of bird species protected under the MBTA can be found in 50 CFR 10.13.
The MBTA also provides the USFWS regulatory authority to protect families of migratory birds. The law prohibits any "*take*" of migratory bird species by any entities, except as permitted by the USFWS. Under permitting guidelines in the Act, the USFWS may issue depredation permits to requesters experiencing damage caused by bird species protected under the Act. Information regarding migratory bird permits can be found in 50 CFR 13 and 50 CFR 21. European starlings, rock pigeons, house sparrows, and feral waterfowl are considered non-native species in the United States and are afforded no protection under the MBTA. A depredation permit from the USFWS is not required to take starlings, pigeons, house sparrows, and feral waterfowl. All actions conducted in this EA would comply with the regulations of the MBTA, as amended.

The law was further clarified to include only those birds afforded protection from take in the United States by the Migratory Bird Treaty Reform Act of 2004. Under the Reform Act, the USFWS published a list of bird species not protected under the MBTA (70 FR 12710-12716).

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

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

Pursuant to the MBTA under 50 CFR 21.43, a depredation permit is not required to lethally take blackbirds when those species are found committing or about to commit depredations upon ornamental or shade trees, agricultural crops, livestock, or wildlife, or when concentrated in such numbers and manner as to constitute a health hazard or other nuisance. Those bird species that could be lethally taken under the blackbird depredation order that are addressed in the assessment include American crows, red-winged blackbirds, common grackles, and brown-headed cowbirds.

Depredation Order for Double-crested Cormorants at Aquaculture Facilities (50 CFR 21.47)

The AQDO was established to reduce cormorant depredation of aquacultural stock at private fish farms and state and federal fish hatcheries. Under the AQDO, cormorants can be lethally taken at commercial freshwater aquaculture facilities and state and federal fish hatcheries in 13 States. However, the AQDO does not include facilities in Maine. The Order authorizes landowners, operators, and tenants, or their employees/agents, that are actually engaged in the production of aquacultural commodities to lethally take cormorants causing or about to cause damage at those facilities without the need for a depredation permit. Those activities can only occur during daylight hours and only within the boundaries of the aquaculture facility. The AQDO also authorizes WS to take cormorants at roost sites near aquaculture facilities at any time from October through April, without the need for a depredation permit when appropriate landowner permissions have been obtained.

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

The purpose of the PRDO is to reduce the actual occurrence, and/or minimize the risk, of adverse impacts of cormorants to public resources. Public resources, as defined by the PRDO, are natural resources managed and conserved by public agencies. Public resources include fish (free-swimming fish and stocked fish at federal, State, and tribal hatcheries that are intended for release in public waters), wildlife, plants, and their habitats. The Order authorizes WS, state fish and wildlife agencies, and federally recognized Tribes in 24 states to conduct damage management activities involving cormorants without the need for a depredation permit from the USFWS, but does not include Maine. It authorizes the take of cormorants on "*all lands and freshwaters*" including public and private lands. However, landowner/manager permission must be obtained before cormorant damage management activities may be conducted at any site.

Depredation Orders for Canada Geese

As discussed previously, the USFWS developed an EIS to evaluate alternatives to address increasing resident Canada goose populations across the United States and to reduce associated damage (USFWS 2005). In addition, several depredation orders have been established to manage damage associated with resident Canada geese when certain criteria occur. Under 50 CFR 21.49, resident Canada geese can be lethally taken at airports and military airfields without the need for a depredation permit by airport authorities or their agents when those geese are causing damage or posing a threat of damage to aircraft. A Canada goose nest and egg depredation order has also been established that allows the nests and eggs of those geese causing or posing a threat to people, property, agricultural crops, and other interests to be destroyed without the need for a depredation permit once the participant has registered with the USFWS (see 50 CFR 21.50). A similar depredation order was established to manage damage to agricultural resources associated with Canada geese. Under 50 CFR 21.51, Canada geese can be lethally taken without a permit from the USFWS in those States designated, including Maine, when geese are causing damage to agricultural resources. Under the depredation orders for Canada geese, no individual federal depredation permit is required to take geese once the criteria of those orders are met. However, a State permit may still be required to lethally take geese.

Control Order for Muscovy Ducks (50 CFR 21.54)

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

Bald and Golden Eagle Protection Act (16 USC 668)

Congress enacted the Bald Eagle Protection Act (16 USC 668) in 1940; thereby, making it a criminal offense for any person to "*take*" or possess any bald eagle or any part, egg, or nest. The Act contained several exceptions that permitted take under certain 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 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 of 1973

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)).

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 methods described in this EA that would be available for use under the alternatives cause major ground disturbance, any physical destruction or damage to property, any alterations of property, wildlife habitat, or landscapes, nor involves the sale, lease, or transfer of ownership of any property. In general, such methods also do not have the potential to introduce visual, atmospheric, or audible elements to areas in which they are used that could result in effects on the character or use of historic properties. Therefore, the methods that could be used by WS under the alternatives 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 were planned under an alternative selected because 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 animals 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 minimization factor for this issue is that virtually all the methods involved would only have temporary effects on the audible nature of a site and could 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 in Minority and Low-income Populations - Executive Order 12898

Executive Order 12898 promotes the fair treatment of people of all races, income levels, and cultures with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Environmental justice is the pursuit of equal justice and protection under the law for all environmental statutes and regulations without discrimination based on race, ethnicity, or socioeconomic status. 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 minority and low-income persons or populations. All activities are evaluated for their impact on the human environment and compliance with Executive Order 12898.

WS would only use legal, effective, and environmentally safe methods, tools, and approaches. Chemical methods employed by WS would be regulated by the EPA through FIFRA, the MDABPC, by MOUs with land managing agencies, and by WS' Directives. WS would properly disposes of any excess solid or hazardous waste. It is not anticipated that the alternatives would result in any adverse or disproportionate environmental impacts to minority and low-income persons or populations. In contrast, the two of the alternatives analyzed in detail may benefit minority or low-income populations by reducing threats to public health and safety and property damage.

Protection of Children from Environmental Health and Safety Risks - 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. WS and the USFWS make it a high priority to identify and assess environmental health and safety risks that may disproportionately affect children. WS and the USFWS have considered the impacts that this proposal might have on children. The proposed activities 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 and the USFWS conclude that it would not create an environmental health or safety risk to children from implementing the proposed action alternative or the other alternatives.

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

Executive Order 13186 requires each federal agency taking actions that have, or are likely to have, a measurable negative effect on migratory bird populations to develop and implement a MOU with the USFWS that shall promote the conservation of migratory bird populations. APHIS has developed a MOU with the USFWS as required by this Executive Order and WS would abide by the MOU.

Invasive Species - Executive Order 13112

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

The Native American Graves and Repatriation Act of 1990

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

Federal Insecticide, Fungicide, and Rodenticide Act of 1996

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

Coastal Zone Management Act of 1972, as amended (16 USC 1451-1464, Chapter 33; PL 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 through approval as an Investigational New Animal Drug (INAD), which allows use of the drug as a non-lethal form of live-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.

1.7 DECISIONS TO BE 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 MDIFW is responsible for managing wildlife in the State of Maine, including bird species. The MDIFW establishes and enforces regulated hunting seasons in the State, including the establishment of hunting seasons that allow the harvest of some of the bird species addressed in this assessment. For migratory birds, the MDIFW 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 would be coordinated with the USFWS and the MDIFW, which would ensure WS' actions were 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 MDIFW; therefore, the take of those bird species to alleviate damage or reduce threats of damage would only occur at the discretion of those agencies. In addition, annual take of birds by WS to alleviate damage or threats of damage under the alternatives analyzed would only occur at levels authorized by those agencies as specified in depredation permits.

Based on the scope of this EA, the decisions to be made are: 1) should WS, in cooperation with the USFWS, conduct bird damage management to alleviate damage to agriculture, property, natural resources, and threats to human safety, 2) should the Migratory Bird Program in USFWS Region 5 issue depredation permits to WS and other entities to conduct bird damage management activities when requested, 3) should WS conduct disease surveillance and monitoring in the bird population when requested by the MDIFW, the USFWS, and other agencies, 4) should WS, in cooperation with the USFWS, implement an integrated damage management strategy, including technical assistance and direct operational assistance, to meet the need for bird damage management in Maine, 5) if not, should WS and/or the USFWS attempt to implement one of the other alternatives described in the EA, and 6) would the alternatives result in effects to the human environment requiring the preparation of an EIS.

CHAPTER 2: AFFECTED ENVIRONMENT AND ISSUES

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

2.1 AFFECTED ENVIRONMENT

Damage or threats of damage caused by those bird species addressed in this EA can occur statewide in Maine wherever those species of birds occur. However, assistance would only be provided by WS when requested by a landowner or manager and only on properties where a cooperative service agreement or other comparable document had been signed between WS and the cooperating entity. Most species of birds addressed in this EA can be found throughout the year across the State where suitable habitat exists for foraging, loafing, roosting, and breeding. Those bird species addressed in this EA are capable of utilizing a variety of habitats in the State. Since those bird species addressed in this EA can be found throughout most of the State, requests for assistance to manage damage or threats of damage could occur in areas occupied by those bird species. Additional information on the affected environment is provided in Chapter 4.

Upon receiving a request for assistance, the proposed action alternative or those actions described in the other alternatives could be conducted on private, federal, State, tribal, and municipal lands in Maine to reduce damages and threats associated with birds to agricultural resources, natural resources, property, and threats to human safety. The analyses in this EA are intended to apply to actions taken under the selected alternative that could occur in any locale and at any time within the analysis area. This EA analyzes the potential impacts of bird damage management and addresses activities in Maine that are currently being conducted under a MOU or cooperative service agreement with WS where activities have been and currently are being conducted. This EA also addresses the potential impacts of bird damage management in the State where additional agreements may be signed in the future. The USFWS would only issue a depredation permits for the take of birds when requested; therefore, this EA evaluates information from depredation permits issued previously by the USFWS to alleviate damage.

Upon receipt of a request for assistance, bird damage management activities under the alternatives, where permitted, could be conducted on federal, State, tribal, municipal, and private properties in Maine. The affected environment 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 residential buildings, golf courses, athletic fields, recreational areas, swimming beaches, parks, corporate complexes, subdivisions, businesses, industrial parks, schools, agricultural areas, wetlands, restoration sites, cemeteries, public parks, bridges, industrial sites, urban/suburban woodlots, hydro-electric dam structures, reservoirs and reservoir shore lands, nuclear, hydro and fossil power plant sites, substations, transmission line rights-of-way, landfills, on ship fleets, military bases, or at any other sites where birds may roost, loaf, or nest. Damage management activities could be conducted at agricultural fields, vineyards, orchards, farmyards, dairies, ranches, livestock operations, grain mills, and grain handling areas (*e.g.*, railroad yards) where birds destroy crops, feed on spilled grains, or contaminate food products for human or livestock consumption. Additionally, activities could be conducted at airports and surrounding properties where birds represent a threat to aviation safety.

Environmental Status Quo

As defined by the NEPA implementing regulations, the "*human environment shall be interpreted comprehensively to include the natural and physical environment and the relationship of people with that environment*" (40 CFR 1508.14). Therefore, when a federal action agency analyzes its potential impacts on the "*human environment*", it is reasonable for that agency to compare not only the effects of the federal action, but also the potential impacts that occur or would occur from a non-federal entity conducting the action in the absence of the federal action. This concept is applicable to situations involving federal assistance in managing damage associated with wildlife species.

Most bird species are protected under state and/or federal law and to address damage associated with those species, a permit must be obtained from the appropriate federal and/or state agency. However, in some situations, with the possible exception of restrictions on methods (*e.g.*, firearms restrictions, pesticide regulations), some species can be managed without the need for a permit when they are causing damage (*e.g.*, take under depredation orders, unprotected bird species). 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 harvest, and harvest limits, which are implemented by the MDIFW.

Under the blackbird depredation order, blackbirds can be addressed by any entity without the need for depredation permit when those species identified in the Order are found committing damage, when found about to commit damage, or when posing a human safety threat. Similarly, in other states, double-crested cormorants can be lethally taken under the AQDO and the PRDO without the need for a permit by those entities authorized. Resident Canada geese and Muscovy ducks can also be addressed without the need for a depredation permit pursuant to several depredation orders (see Section 1.6). If a bird species is not afforded protection under the MBTA (see 50 CFR 10.13), then a depredation permit from the USFWS and the MDIFW is not required to address damage or threats of damage associated with those species. Free-ranging or feral domestic waterfowl, rock pigeons, European starlings, and house sparrows are not afforded protection under the MBTA and a depredation permit is not required to address damage associated with those species.

When a non-federal entity (*e.g.*, agricultural producers, health agencies, municipalities, counties, private companies, individuals, or any other non-federal entity) takes an action involving a bird species, the action is not subject to compliance with the NEPA due to the lack of federal involvement[8] in the action. Under such circumstances, the environmental baseline or status quo must be viewed as an environment that includes those resources as they are managed or impacted by non-federal entities in the absence of the federal action being proposed. Therefore, in those situations in which a non-federal entity has decided that a management action directed towards birds should occur and even the particular methods that should be used, WS' involvement in the action would not affect the environmental status quo since the entity could take the action in the absence of WS' involvement. Since take could occur during hunting seasons, under depredation/control orders, through the issuance of depredation permits, or for some species take can occur at any time without the need for a depredation permit, an entity could take an action in the absence of WS' involvement. WS' involvement would not change the environmental status quo if the requestor had conducted the action in the absence of WS' involvement in the action.

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

In addition, most methods available for alleviating damage would be available to WS and to other entities. Therefore, WS' decision-making ability would be restricted to one of three alternatives. Under those three alternatives, WS could take the action using the specific methods as decided upon by the non-federal entity, provide technical assistance only, or take no action. If no action were taken by WS, the non-federal entity could take the action anyway either without the need for a permit, during the hunting season, under a depredation/control order, or through the issuance of a depredation permit by the USFWS and the MDIFW. Under those circumstances, WS would have virtually no ability to affect the environmental status quo since the action would likely occur in the absence of WS' direct involvement.

Therefore, based on the discussion above, it is clear that in those situations where a non-federal entity has obtained the appropriate permit or authority, 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 would not affect the environmental status quo.

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. Those issues identified in the cormorant management FEIS (USFWS 2003) and the resident Canada goose FEIS (USFWS 2005) developed were reviewed, and considered during the development of this EA. Issues related to managing damage associated with birds in Maine were developed by WS in cooperation with the USFWS and in consultation with the MDIFW. This EA will also be made available to the public for review and comment to identify additional issues.

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

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 available to resolve damage or threats to human safety are categorized into non-lethal and lethal methods. Non-lethal methods available can disperse or otherwise make an area unattractive to target species causing damage, which reduces the presence of those species at the site and potentially the immediate area around the site where non-lethal methods were employed. Lethal methods would also be available to remove a bird or those birds responsible for causing damage or posing threats to human safety. Therefore, if lethal methods were used, the removal of a bird or birds would result in local population reductions in the area where damage or threats were occurring. The number of individual birds from a target species that could be removed from a species' population using lethal methods under the alternatives would be dependent on the number of requests for assistance received, the number of individual birds involved with the associated damage or threat, and the efficacy of methods employed.

Those methods available to address bird damage in the State are described in Appendix B of this EA. Not all of the methods available to address bird damage would be available for use under the alternatives identified in Chapter 3. For example, alpha-chloralose as a non-lethal capture method for waterfowl would not be available for use by other entities except under the proposed action alternative since the method is restricted to use by employees of WS. Under the proposed action alternative, WS could incorporate non-lethal and lethal methods described in Appendix B in an integrated approach in which all or a combination of methods could be employed to resolve a request for assistance. Under certain alternatives, WS could recommend both non-lethal and lethal methods, as governed by federal, state, and local laws and regulations.

Non-lethal methods could disperse or otherwise make an area unattractive to target species that were causing damage, which could reduce the presence of those species at the site and potentially the immediate area around the site where non-lethal methods were employed. Under certain alternatives, lethal methods would be available to remove a bird or those birds responsible for causing damage or posing threats to human safety. Therefore, the use of lethal methods could 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 to determine the magnitude of impacts on the populations of those species addressed in this EA from the use of lethal methods would be based on a measure of the number of individuals lethally removed in relation to that species' abundance. Magnitude may be determined either quantitatively or qualitatively. Quantitative determinations would be based on population estimates, allowable harvest levels, and actual harvest data. Qualitative determinations would be based on population trends and harvest trend data, when available. Take would be monitored by comparing the number of birds lethally removed with overall populations or trends. Lethal methods would only be used by WS at the request of a cooperator seeking assistance and only after the take of those bird species had been permitted by the USFWS and the MDIFW pursuant to the MBTA, when required.

In addition, some of the bird species addressed in this EA can be harvested in the State during annual hunting seasons. Therefore, any activities conducted by WS under the alternatives addressed would be occurring along with other natural process and human-induced events such as natural mortality, human-induced mortality from private damage management activities, mortality from regulated harvest, and human-induced alterations of wildlife habitat.

Methods available under each of the alternatives to alleviate damage and reduce threats to human safety would be employed targeting an individual of a bird species or a group of individuals after applying the WS' Decision Model (Slate et al. 1992) to identify possible techniques. The effects on the populations of target bird populations in Maryland from implementation of the alternatives addressed in detail, including the proposed action, are analyzed in Chapter 4. Information on bird populations and trends are often derived from several sources including the Breeding Bird Survey (BBS), the Christmas Bird Count (CBC), the Partners in Flight Landbird Population database, published literature, and harvest data. Further information on those sources of information is provided below.

Breeding Bird Survey

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 along roadways for a set duration along a pre-determined route. Routes are 24.5 miles long and are surveyed once per year with the observer stopping every 0.5 miles along the route to conduct the survey. The numbers of birds observed and heard within 0.25 miles of each of the survey points are recorded during a 3-minute sampling period at each point. Surveys were started in 1966 and are conducted in June, which is generally considered as the period of time when those birds present at a location are likely breeding in the immediate area. The BBS is conducted annually in the United States, across a large geographical area, under standardized survey guidelines. The BBS is a large-scale inventory of North American birds coordinated by the United States Geological Survey, Patuxent Wildlife Research Center (Sauer et al. 2012). The BBS is a combined set of over 3,700 roadside survey routes primarily covering the continental United States and southern Canada. The primary objective of the BBS has been to generate an estimate of population change for all breeding birds. Populations of birds tend to fluctuate, especially locally, because of variable local habitat and climatic conditions. Trends can be determined using different population equations and statistically tested to determine if a trend is statistically significant.

Current estimates of population trends from BBS data are derived from hierarchical model analysis (Link and Sauer 2002, Sauer and Link 2011) and are dependent upon a variety of assumptions (Link and Sauer 1998). The statistical significance of a trend for a given species is also determined using BBS data (Sauer et al. 2012).

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 in the 1990s, 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) surveyed 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).

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 based on the number of birds observed within a 15-mile diameter circle around a central point (177 mi^2). The CBC data does not provide a population estimate; however, the data can be used as an indicator of trends in the population over time. Researchers have found that population trends reflected in CBC data tend to correlate well with those from censuses taken by more stringent means (NAS 2010).

Atlantic Flyway Breeding Waterfowl Plot Survey

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

Bird Conservation Regions

BCRs are areas in North America that are characterized by distinct ecological habitats that have similar bird communities and resource management issues. The State of Maine lies almost entirely within the Atlantic Northern Forest region (BCR 14). This region is characterized by nutrient-poor soils that support spruce-fir forests in the northerly portion of the region and higher elevations of the Adirondack

Mountains, while hardwood forests dominate elsewhere. BCR 14 encompasses most of Maine, Vermont, New Hampshire, and parts of New York, Massachusetts, and Connecticut (USFWS 2000).

The New England/Mid-Atlantic Coast region (BCR 30) overlaps a very small portion of the State in the extreme southeastern corner. BCR 30 encompasses the coastal areas of States ranging from southern Maine to Virginia. Of all the BCR in the United States, BCR 30 has the highest human population densities. Much of the region was converted to agricultural production as human settlements in the region expanded, but today the region is dominated by forest and residential use (USFWS 2000).

Annual Harvest Estimates

The populations of several migratory bird species are sufficient to allow for annual hunting seasons that 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 MDIFW. Those species addressed in this EA that have established hunting seasons include Canada geese, American black ducks, mallards, hooded mergansers, common mergansers, red-breasted mergansers, and American crows. This EA also addresses the non-migratory, wild turkey, which also has an established hunting season.

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 that are hunted, the number of birds harvested during the season is reported by the USFWS and/or the MDIFW in published reports.

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

The issue of effects on non-target and T&E species arises from the use of non-lethal and lethal methods identified in the alternatives. The use of non-lethal and lethal methods has the potential to inadvertently disperse, capture, or kill non-target wildlife. To reduce the risks of adverse effects to non-target wildlife, WS would select damage management methods that were as target-selective as possible or would apply such methods in ways to reduce the likelihood of capturing non-target species. Before initiating management activities, WS would select locations that were extensively used by the target species. WS would also use SOPs designed to reduce the effects on non-target species' populations. SOPs are further discussed in Chapter 3. Methods available for use under the alternatives are described in Appendix B.

Concerns have also been raised about the potential for adverse effects to occur to non-target wildlife from the use of chemical methods. Chemical methods that would be available to manage damage or threats of damage associated with birds include the avicide DRC-1339, Avitrol, mesurol, alpha chloralose, nicarbazin, and taste repellents. Chemical methods that could be available for use to manage damage and threats associated with birds in Maine are further discussed in Appendix B.

The ESA states that all federal agencies *"...shall seek to conserve endangered and threatened species and shall utilize their authorities in furtherance of the purposes of the Act"* [Sec. 7(a)(1)]. WS conducts Section 7 consultations with the USFWS to ensure compliance with the ESA and to ensure that *"any action authorized, funded or carried out by such an agency...is not likely to jeopardize the continued existence of any endangered or threatened species…Each agency shall use the best scientific and commercial data available"* [Sec. 7(a)(2)].

Special efforts are made to avoid jeopardizing T&E species through biological evaluations of the potential effects and the establishment of special restrictions or minimization measures. As part of the scoping process to facilitate interagency cooperation, WS consulted with the USFWS pursuant to Section 7 of the ESA during the development of this EA, which is further discussed in Chapter 4.

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

An additional issue often raised is the potential risks associated with employing methods to manage damage caused by target species. Both chemical and non-chemical methods have the potential to have adverse effects on human safety. WS' employees would use and recommend only those methods that were legally available, selective for target species, and were effective at resolving the damage associated with the target species. Still, some concerns exist regarding the safety of methods despite their legality. As a result, this EA will analyze the potential for proposed methods to pose a risk to members of the public and employees of WS. In addition to the potential risks to the public associated with WS' methods, risks to employees would also be an issue. WS' employees could potentially be exposed to damage management methods as well as subject to workplace accidents. Selection of methods would include consideration for public and employee safety.

Safety of Chemical Methods Employed

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

Several avian repellents are commercially available to disperse birds from an area or discourage birds from feeding on desired resources. Avitrol is flock dispersal methods available for use to manage damage associated with some bird species. For those species addressed in this assessment, Avitrol is available to manage damage associated with red-winged blackbirds, common grackles, brown-headed cowbirds, European starlings, house sparrows, rock pigeons, and crows. Other repellents are also available with the most common ingredients being polybutene, anthraquinone, and methyl anthranilate. An additional repellent being considered for use in this assessment is mesurol, which is intended for use to discourage crows from predating on eggs of T&E species.

Alpha chloralose is also being considered as a method that could be employed under the alternatives to manage damage associated with waterfowl. Alpha-chloralose could be used to sedate waterfowl temporarily and lessen stress on the animal from handling and transportation from the capture site. Drugs delivered to immobilize waterfowl would occur on site with close monitoring to ensure proper care of the animal. The effects of alpha-chloralose are reversible with a full recovery of sedated animals occurring. Reproductive inhibitors containing the active ingredient nicarbazin could also be available under the alternatives. Nicarbazin is the only reproductive inhibitor currently registered with the EPA for use to manage local populations of waterfowl and pigeons by reducing or eliminating the hatchability of laid eggs. The use of chemical methods would be regulated by the EPA through the FIFRA, by the FDA, the MDABPC, and by WS Directives[9]. Chemical methods are further discussed in Appendix B of this EA.

Safety of Non-Chemical Methods Employed

[9]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.

Most methods available to alleviate damage and threats associated with birds are considered non-chemical methods. Non-chemical methods employed to reduce damage and threats to safety caused by birds, if misused, could potentially be hazardous to human safety. Non-chemical methods are also discussed in detail in Appendix B. The cooperator requesting assistance would be made aware through a MOU, cooperative service agreement, or a similar document that those devices agreed upon could potentially be used on property owned or managed by the cooperator. Making a cooperator aware of the potential methods that could be used on properties they own or manage would assist with identifying any risks to human safety associated with the use of those methods. Many of the non-chemical methods would only be activated when triggered by attending personnel (*e.g*., cannon nets, firearms, pyrotechnics, lasers), are passive live-capture methods (*e.g*., walk-in style live-traps, mist nets), or are passive harassment methods (*e.g*., effigies, exclusion techniques, anti-perching devices, electronic distress calls).

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 was 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 recommending a local population of harvestable birds be reduced through hunting.

Many of the non-chemical methods available would only be activated when triggered by attending personnel (*e.g*., cannon nets, firearms, pyrotechnics, lasers), are passive live-capture methods (*e.g*., walk-in style live-traps, mist nets), or are passive harassment methods (*e.g*., effigies, exclusion techniques, anti-perching devices, electronic distress calls). The primary safety risk of most non-chemical methods occurs directly to the applicator or those people 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 Maine would be available for use under any of the alternatives and could be employed by any entity, when permitted. Risks to human safety from the use of non-chemical methods will be further evaluated as this issue relates to the alternatives in Chapter 4.

Effects of Not Employing Methods to Reduce Threats to Human Safety

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

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

Issue 4 - Effectiveness of 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 practitioners diagnosed the problem, the species responsible for the damage, and how actions were 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 within the limitations of current technology, funding, and workforce. The most effective approach to resolving any damage problem would be to use an adaptive approach, which may call for the use of several management methods simultaneously or sequentially (Courchamp et al. 2003).

The purpose behind integrated management is to implement methods in the most effective manner while minimizing the potentially harmful effects on humans, target and non-target species, and the environment[10]. Efficacy is based on the types of methods employed, the application of the method, restrictions on the use of the method(s), the skill of the personnel using the method and, for WS' personnel, the guidance provided by WS' directives and policies.

The goal would be to reduce damage, risks, and conflicts with birds as requested and not to necessarily reduce/eliminate populations. Localized population reduction could be short-term since new individuals may immigrate to an area, be released at the site, or new individuals could 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 return to pre-management population levels eventually 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.

Based on the evaluation of the damage, the most effective methods would 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 would be further evaluated for effectiveness based on a continuous evaluation of activities by WS. Therefore, the effectiveness of methods would be considered as part of the decision process for each damage management request based on continual evaluation of methods and results.

Issue 5 - 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 neighboring residents. Wildlife is generally 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 that attraction likely started when people began domesticating animals. The American public shares a similar bond with animals and/or wildlife in general and in modern societies, large percentages of households have indoor

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

or outdoor pets. Some people may consider individual wild animals and birds as "*pets*" or exhibit affection toward those animals, especially people who enjoy viewing wildlife. Therefore, the public reaction is variable and mixed to wildlife damage management because there are numerous philosophical, aesthetic, and personal attitudes, values, and opinions about the best ways to manage conflicts/problems between humans and wildlife.

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

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

Public attitudes toward wildlife vary considerably. Some people believe that all wildlife should be captured and translocated to another area to alleviate damage or threats to protected resources. Some people that are directly affected by the problems caused by wildlife strongly support lethal removal. Individuals not directly affected by the harm or damage may be supportive, neutral, or adamantly opposed to any removal of wildlife from specific locations. Some people opposed to wildlife damage management want agencies to teach tolerance for damage and threats caused by wildlife, and that wildlife should never be killed. Some of the people who oppose removal of wildlife do so because of human-affectionate bonds with individual wildlife. Those human-affectionate bonds are similar to attitudes of a pet owner and result in aesthetic enjoyment.

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

Issue 6 - Humaneness and Animal Welfare Concerns of Methods

The issue of humaneness and animal welfare, as it relates to the capturing or killing 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 stated, "*...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 stated that "[f]*or wild and feral animals, many of the recommended means of euthanasia for captive animals are not feasible. In field circumstances, wildlife biologists generally do not use the term euthanasia, but terms such as killing, collecting, or harvesting, recognizing that a distress- free death may not be possible*" (Beaver et al. 2001).

Pain and suffering, as it relates to methods available for use to manage birds has both a professional and lay point of arbitration. Wildlife managers and the public would be better served to recognize the complexity of defining suffering, since *"…neither medical nor veterinary curricula explicitly address suffering or its relief"* (California Department of Fish and Game 1991). Research suggests that some methods can cause "*stress*" (Kreeger et al. 1988). However, such research has not yet progressed to the development of objective, quantitative measurements of pain or stress for use in evaluating humaneness (Bateson 1991).

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 in Chapter 4 as those concerns relate to the methods available under the alternatives. SOPs to alleviate pain and suffering are discussed in Chapter 3.

Issue 7 – Effects of Bird Damage Management Activities on the Regulated Harvest of Birds

Another issue commonly identified is a concern that activities conducted by WS would affect the ability of persons to harvest birds during the regulated hunting seasons either by reducing local populations through the lethal removal of birds or by reducing the number of birds present in an area through dispersal techniques. Those species addressed in this EA that can also be hunted during regulated seasons in the State include Canada geese, American black ducks, mallards, hooded mergansers, common mergansers, red-breasted mergansers, wild turkeys, and American crows. 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 would be used to reduce bird densities through dispersal in areas where damage or the threat of damage was occurring. Similarly, lethal methods used to reduce damage associated with those birds could lower densities in areas where damage was 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 identified by WS, the MDIFW, and the USFWS during the scoping process of this EA. The following issues were considered by WS, the MDIFW, and the USFWS during the development of this EA; however, those issues will not be analyzed in detail for the reasons provided.

Appropriateness of Preparing an EA (Instead of an EIS) For Such a Large Area

A concern was raised that an EA for an area as large as the State of Maine 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 describe accurately such locations or times in an EA or an EIS. Although WS could predict some of the possible locations or types of situations and sites where some kinds of wildlife damage would occur, the program cannot predict the specific locations or times at which affected resource owners would determine a damage problem has become intolerable to the point that they request assistance from WS. In addition, the WS program would not be able to prevent such damage in all areas where it might occur without resorting to the destruction of wild animal populations over broad areas at a much more intensive level than would be desired by most people, including WS and other agencies. Such broad scale population management would also be impractical or impossible to achieve within WS' policies and professional philosophies.

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

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

WS' Impact on Biodiversity

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

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 the plaintiffs' motion for a preliminary injunction. In part, the court found that to establish a need for wildlife damage management a forest supervisor needs only to show that damage from wildlife was threatened (Civil No. 92-C-0052A January 20, 1993). Thus, there is judicial precedence indicating that it is not necessary to establish a criterion such as a percentage of loss of a particular resource to justify the need for damage management actions.

Effects on Human Health from Consumption of Waterfowl

Of concern under this issue is the consumption of waterfowl meat donated to a charitable organization after being lethally taken by WS. Of recent concern is the potential for lead bullet fragments to be present in meat that has been processed for human consumption. In addition, the potential for the spreading of zoonotic diseases or other contaminants in waterfowl processed and donated for human consumption would be a concern.

In order to address potential health concerns associated with consuming waterfowl, waterfowl donated for human consumption may be tested for exposure to substances such as organophosphate and carbamate insecticides, lead, mercury, arsenic, organochlorines, and organic chemicals prior to distribution. The entity selecting the capture/euthanize (and donation for charitable consumption) program would be responsible for all costs associated with legal and appropriate donation for human consumption. Poultry processing facilities utilized for this process would comply with existing USDA regulations pertaining to the processing and handling of fowl (*e.g.*, turkeys, chickens).

Waterfowl immobilized using alpha chloralose would not be donated for human consumption. Disposal of carcasses would occur by deep burial or incineration. Waterfowl taken by any method for disease sampling or in an area where zoonotic diseases of concern were known to be prevalent and of concern to human health after consuming processed waterfowl meat would not be donated for consumption. Again, carcasses would be disposed of by deep burial or incineration.

WS' activities to alleviate damage or threats associated with waterfowl in the State would only occur after receiving a request for direct operational assistance. Therefore, the decision to process waterfowl for human consumption that were taken by WS would be the sole responsibility of the entity requesting assistance. WS would not process and/or donate processed waterfowl meat to charitable organizations and would not be involved with the processing and/or donation of the meat to charitable organizations.

Bird Damage Management Should Not Occur at Taxpayer Expense

An issue identified is the concern that wildlife damage management should not be provided at the expense of the taxpayer or that activities should be fee-based. Funding for activities could be 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 would be funded through cooperative service agreements with individual property owners or managers. A minimal federal appropriation is allotted for the maintenance of a WS program in Maine. The remainder of the WS program would be entirely fee-based. Technical assistance would be provided to requesters as part of the federally funded activities, but all direct assistance in which WS' employees perform damage management activities would be funded through cooperative service agreements between the requester and WS. Therefore, in most cases, the entity requesting assistance would be providing the funding for activities conducted by WS.

Cost Effectiveness of Management Methods

The CEQ does not require a formal, monetized cost benefit analysis to comply with the NEPA. Consideration of this issue would not be essential to making a reasoned choice among the alternatives being considered. However, the methods determined to be most effective at reducing damage and threats to human safety caused by birds and that prove to be the most cost effective would receive the greatest application. As part of an integrated approach, evaluation of methods would continually occur to allow for those methods that were most effective at resolving damage or threats to be employed under similar circumstances where birds were causing damage or posed a threat. Additionally, management operations may be constrained by cooperator funding and/or objectives and needs. The cost effectiveness of methods and the effectiveness of methods are linked. The issue of cost effectiveness as it relates to the effectiveness of methods is discussed further in Section 2.2 of this EA.

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 (*i.e.*, virulence) they may cause. Wild birds, in particular waterfowl and shorebirds, are considered 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 that 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 reassortment (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 the 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 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.

Bird Damage Should Be Managed By Private Nuisance Wildlife Control Agents

Wildlife control agents and private entities could be contacted to reduce bird damage when deemed appropriate by the resource owner. The MDIFW maintains a website with contact information for Animal Damage Control agents in the State[11]. In addition, WS could refer persons requesting assistance to agents and/or private trappers under all of the alternatives fully evaluated in the EA.

WS Directive 3.101 provides guidance on establishing cooperative projects and interfacing with private businesses. WS only responds to requests for assistance received. When responding to requests for

[11]The website can be accessed at http://www.maine.gov/ifw/wildlife/pdfs/ADCListforInfoCenter.pdf; accessed February 8, 2013.

assistance, WS would inform requesters that other service providers, including private entities, might be available to provide assistance.

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 remove birds lethally. As described in Appendix B, the lethal removal of birds with firearms by WS to alleviate damage or threats could occur using a shotgun or rifle, including an air rifle. 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 USFWS Migratory Bird Permit Program has implemented the requirement to use non-toxic shot, as defined under 50 CFR 20.21(j), as part of the standard conditions of depredation permits issued pursuant to the MBTA for the lethal take of birds under 50 CFR 21.41. In 2011, the depredation order for blackbirds (see 50 CFR 21.43(b)) was amended to include the requirement for use of non-toxic shot, as defined under 50 CFR 20.21(j), in most cases. However, this prohibition does not apply if an air rifle, an air pistol, or a .22 caliber rimfire firearm was used for removing depredating birds under the depredation order. To alleviate concerns associated with lead exposure in wildlife, WS would only use non-toxic shot as defined in 50 CFR 20.21(j) when using shotguns.

The take of birds by WS in the State would occur primarily from the use of shotguns. However, the use of rifles, including air rifles, could be employed to remove some species. To reduce risks to human safety and property damage from bullets passing through birds, the use of rifles would be applied in such a way (*e.g*., caliber, bullet weight, distance) to ensure 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 were removed using rifles would occur within areas where retrieval of all bird carcasses for proper disposal would be highly likely (*e.g.,* at roost sites). With risks of lead exposure occurring primarily from ingestion of lead shot and bullet fragments, the retrieval and proper disposal of bird carcasses would greatly reduce the risk of scavengers ingesting or being exposed to lead that may be contained within the carcass.

However, deposition of lead into soil could occur if, during the use of a rifle, the projectile passes through a bird, if misses occur, or if the bird carcass is not retrieved. Laidlaw et al. (2005) reported that, because of the low mobility of lead in soil, all of the lead that accumulates on the surface layer of the soil is generally retained within the top 20 cm (about 8 inches). In addition, concerns occur that lead from bullets deposited in soil from shooting activities could lead to contamination of surface water or ground water. Stansley et al. (1992) studied lead levels in water that was subjected directly to high concentrations of lead shot accumulation because of intensive target shooting at several shooting ranges. Lead did not appear to "*transport*" readily in surface water when soils were neutral or slightly alkaline in pH (*i.e*., not acidic), but lead did transport more readily under slightly acidic conditions. Although Stansley et al. (1992) detected elevated lead levels in water in a stream and a marsh that were in the shot "*fall zones*" at a shooting range, the study did not find higher lead levels in a lake into which the stream drained, except for one sample collected near a parking lot. Stansley et al. (1992) believed the lead contamination near the parking lot was due to runoff from the lot, and not from the shooting range areas. The study also indicated that even when lead shot was highly accumulated in areas with permanent water bodies present, the lead did not necessarily cause elevated lead levels in 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 naturally serves to 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 firearms, as well as most other forms of dry land small game hunting in general, lead contamination from such sources would be minimal to nonexistent.

Since the take of birds could occur by other entities during regulated hunting seasons, through the issuance of depredation permits, under depredation/control orders, or without the need for a depredation permit, WS' assistance with removing birds would not be additive to the environmental status quo. WS' assistance would not be additive to the environmental status quo since those birds removed by WS using firearms could be lethally removed by the entities experiencing damage using the same method in the absence of WS' involvement. The amount of lead deposited into the environment may be lowered by WS' involvement in activities due to efforts by WS to ensure projectiles do not pass through, but are contained within the bird carcass, which would limit the amount of lead potentially deposited into soil from projectiles passing through the carcass. The proficiency training received by WS' employees in firearm use and accuracy increases the likelihood that birds are lethally removed humanely in situations that ensure accuracy and that misses occur infrequently, which would further reduce the potential for lead to be deposited in the soil from misses or from projectiles passing through carcasses. In addition, WS' involvement would ensure efforts were made to retrieve bird carcasses lethally removed using firearms to prevent the ingestion of lead in carcasses by scavengers. WS' involvement would also ensure carcasses were disposed of properly to limit the availability of lead. Based on current information, the risks associated with lead bullets that would be deposited into the environment from WS' activities due to misses, the bullet passing through the carcass, or from bird carcasses that may be irretrievable would be below any level that would pose any risk from exposure or significant contamination. As stated previously, when using shotguns, only non-toxic shot would be used by WS pursuant to 50 CFR 20.21(j). Additionally, WS may utilize non-toxic ammunition in rifles and air rifles as the technology improves and ammunition become more effective and available.

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

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

In urban areas, WS would often work with the community or municipal leaders to address bird damage involving large bird roosts that would likely be affecting several people. Therefore, WS often consults not only with the property owner where roosts were located but also with community leaders to allow for community-based decision-making on the best management approach. In addition, funding would often be provided by the municipality where the roost was located, which would allow activities to occur within city limits where bird roosts occurred. This would allow roosts that relocated to other areas 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.

A Site Specific Analysis Should be Made for Every Location Where Bird Damage Management Could Occur

The underlying intent for preparing an EA is to determine if a proposed action might have a significant impact on the human environment. WS' EA development process is issue driven, meaning issues that were raised during the interdisciplinary process and through public involvement that were substantive, were used to drive the analysis and determine the significance of the environmental impacts of the proposed action and the alternatives. Therefore, the level of site specificity must be appropriate to the issues listed.

The analysis in this EA was driven by the issues raised during the scoping process during the development of the EA. In addition to the analysis contained in this EA, WS' personnel use the WS Decision Model (Slate et al. 1992) described in Chapter 3 as a site-specific tool to develop the most appropriate strategy at each location. The WS Decision Model is an analytical thought process used by WS' personnel for evaluating and responding to requests for assistance.

As discussed previously, one EA analyzing effects for the entire State would provide a more comprehensive and less redundant analysis than multiple EAs covering smaller areas. A single EA would also allow for a better cumulative impact analysis. If a determination were made through this EA that the alternatives developed to meet the need for action could result in a significant effect on the quality of the human environment, then an EIS would be prepared.

CHAPTER 3: ALTERNATIVES

Chapter 3 contains a discussion of the alternatives that were developed to address the identified issues discussed in Chapter 2. Alternatives were developed for consideration based on the issues using the WS Decision model (Slate et al. 1992). The alternatives will receive detailed environmental impacts analysis in Chapter 4 (Environmental Consequences). Chapter 3 also discusses alternatives considered but not analyzed in detail, with rationale. SOPs for bird damage management in Maine are also discussed in Chapter 3.

3.1 DESCRIPTION OF THE ALTERNATIVES

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

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 (Slate et al. 1992; see WS Directive 2.201), to reduce damage and threats caused by birds in Maine. A major goal of the program would be to resolve and prevent bird damage and to reduce threats to human safety[12]. To meet this goal, WS, in cooperation with the USFWS and in consultation with the MDIFW, would continue to respond to requests for assistance with, at a minimum, technical assistance, or when funding was available, operational damage management. Therefore, under this alternative, WS could respond to requests for assistance by: 1) taking no action if warranted, 2) providing only technical assistance to property owners or managers on actions they could take to reduce damages caused by birds, or 3) providing technical assistance and direct operational assistance to a property owner or manager experiencing damage. Funding for activities conducted by WS could occur through federal appropriations; however, in most cases, those entities requesting assistance would provide the funding for activities conducted by WS.

A key component of assistance provided by WS would be providing information to the requester about wildlife and wildlife damage. 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. When responding to a request for assistance, WS would provide those entities with information regarding the use of appropriate methods. Property owners or managers requesting assistance would be provided with information regarding the use of effective and practical techniques and methods. In addition to the routine dissemination of recommendations and information to individuals or organizations experiencing damage, WS provides lectures, courses, and demonstrations to producers, homeowners, state and county agents, colleges and universities, and other interested groups. WS frequently cooperates 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. Providing information about bird damage and methods would be a primary component of technical assistance and direct operational assistance available from WS under this alternative.

The WS program in Maine 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 extent of the damage, and previous methods that the cooperator has employed to resolve the problem. WS would then provide 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. Between FY 2006 and FY 2011, WS has conducted 704 technical assistance projects in Maine associated with birds addressed in this assessment. Technical assistance provided by WS would occur as described in Alternative 2 of this EA.

Direct operational damage management assistance would include damage management activities that would be directly conducted by or supervised by personnel of WS. Operational damage management assistance may be initiated when the problem could not effectively be resolved through technical assistance alone and there was a MOU, cooperative service agreement, or other comparable document signed between WS and the entity requesting assistance. The initial investigation would define the nature, history, and extent of the problem; species responsible for the damage; and methods available to resolve the problem.

Under this alternative, the WS program in Maine 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,

[12]All management actions conducted or recommended by WS would comply with appropriate federal, state, and local laws in accordance with WS Directive 2.210.

and reasonable methods available to a local decision-maker(s) to reduce damage or threats. WS and other state and federal wildlife management agencies may facilitate discussions at local community meetings when resources are available. Those entities requesting assistance could choose to use the services of private businesses, use volunteer services of private organizations, implement WS' recommendations on their own (*i.e.*, technical assistance), request direct assistance from WS (*i.e.*, direct operational assistance), or take no action. Generally, a decision-maker seeking assistance would be part of a community, municipality, business, governmental agency, and/or a private property owner.

Under a community based decision-making process, WS would provide information, demonstration, and discussion on all available methods to the appropriate representatives of the community for which services were requested to ensure a community-based decision was made. By involving decision-makers in the process, damage management actions can be presented to allow decisions on damage management to involve those individuals that the decision-maker(s) represents. As addressed in this EA, WS would provide technical assistance to the appropriate decision-maker(s) to allow for information on damage management activities to be presented to those persons represented by the decision-maker(s), including demonstrations and presentation by WS at public meetings to allow for involvement of the community. Requests for assistance to manage birds often originate from the decision-maker(s) based on community feedback or from concerns about damage or threats to human safety. As representatives, the decision-maker(s) are able to provide the information to local interests either through technical assistance provided by WS or through demonstrations and presentations by WS on activities to manage damage. This process allows decisions to be made based on local input.

The decision-maker for the local community would be elected officials or representatives of the communities. The elected officials or representatives are popularly elected residents of the local community or appointees who oversee the interests and business of the local community. This person or persons 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. Identifying the decision-maker for local business communities can be more complex because business owners 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 operational assistance could be provided by WS only if requested by the local community decision-maker, funding was provided, and if the requested assistance was compatible with WS' recommendations.

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

WS would work with those persons experiencing bird damage to address those birds responsible for causing damage as expeditiously as possible. To be most effective, damage management activities should begin as soon as birds begin to cause damage. Bird damage that has been ongoing can be difficult to resolve using available methods since birds are conditioned to feed, roost, loaf, and are familiar with a particular location. Subsequently, making that area unattractive using available methods can be difficult to achieve once damage has been ongoing. WS would work closely with those entities requesting assistance to identify situations where damage could occur and begin to implement damage management activities under this alternative as early as possible to increase the likelihood of those methods achieving the level of damage reduction requested by the cooperating entity.

In general, the most effective approach to resolving damage would be to integrate the use of several methods simultaneously or sequentially. This adaptive approach to managing damage associated with birds would integrate the use of the most practical and effective methods as determined by a site-specific evaluation for each request after applying the WS Decision Model. The philosophy behind an adaptive approach would be to integrate the best combination of methods in a cost-effective[13] manner while minimizing the potentially harmful effects on humans, target and non-target species, and the environment. Integrated damage management may incorporate cultural practices (*e.g.*, animal husbandry), habitat modification (*e.g.*, exclusion, vegetation management), animal behavior modification (*e.g.*, scaring, repellents), removal of individual offending animals (*e.g.*, trapping, shooting, and avicides), and local population reduction, or any combination of these, depending on the circumstances of the specific damage problem.

When WS received a request for direct operational assistance, WS would conduct site visits to assess the damage or threat of damage, would identify the species responsible, and would apply the Decision Model described by Slate et al. (1992) and WS Directive 2.201 to determine the appropriate methods to resolve or prevent damage. WS' personnel would assess the damage or threat of damage and then evaluate the appropriateness and availability (legal and administrative) of strategies and methods that would be based on biological, economic, and social considerations. Following this evaluation, methods that were deemed practical for the situation would be incorporated into a strategy to alleviate or prevent damage. After this strategy was implemented, monitoring would be conducted and evaluation would continue to assess the effectiveness of the strategy. If the strategy were effective at alleviating or preventing damage, the need for further management would be ended. In terms of the WS Decision Model, most efforts would consist of continuous feedback between receiving the request and monitoring the results of the strategy to alleviate or prevent damage. The Decision Model is not a written documented process, but a mental problem-solving process common to most, if not all, professions, including WS. WS' Decision Model would be the implementing mechanism for selecting methods under the proposed action alternative that would be adapted to each request.

Methods available to resolve or prevent damage under this alternative could be considered lethal methods or non-lethal methods. Preference would be given to non-lethal methods when practical and effective under this alternative (see WS Directive 2.101). Non-lethal methods that would be available for use by WS would include, but would not be limited to, habitat/behavior modification, nest/egg destruction, lure crops, visual deterrents, live traps, translocation, exclusionary devices, frightening devices, alpha-chloralose, reproductive inhibitors, and chemical repellents (see Appendix B for a complete list and description of potential methods). Lethal methods that would be available to WS would include live-capture followed by euthanasia, DRC-1339, the recommendation of take during hunting seasons, and firearms. Euthanasia of live-captured birds would occur in accordance with WS Directive 2.505. WS would employ cervical dislocation or carbon dioxide to euthanize target birds once those birds were live-captured using other methods. Carbon dioxide would be an acceptable form of euthanasia for birds while cervical dislocation would be a conditionally acceptable[14] method of euthanasia (AVMA 2013). The use

[13]The cost of management may sometimes be secondary because of overriding environmental, legal, human health and safety, animal welfare, or other concerns.
[14]The AVMA (2013) defines conditional acceptable as "...[methods] *that by the nature of the technique or because of greater potential for operator error or safety hazards might not consistently produce humane death or are methods not well documented in the scientific literature".*

of firearms could also be used to euthanize birds live-captured; however, the use of firearms for euthanasia would be considered a conditionally acceptable method for wildlife (AVMA 2013).

As discussed in Chapter 1, the lethal removal of many bird species to alleviate damage would be prohibited unless authorized by the USFWS pursuant to the MBTA. The take of birds can only legally occur through the issuance of a depredation permit by the USFWS and only at levels specified in the permit, unless those bird species are afforded no protection under the MBTA or a depredation/control order has been established by the USFWS, in which case, no permit for take would be required. For some bird species (*e.g.*, waterfowl, turkeys, crows), lethal take can occur during a hunting season. In addition, a permit from the MDIFW may be required to alleviate damage caused by birds in the State. In most cases, the use of non-lethal dispersal methods and the destruction of inactive nests would not require a permit from the USFWS and/or the MDIFW.

The use of many lethal and non-lethal methods would be short-term attempts at reducing damage occurring at the time those methods were employed. Long-term solutions to managing bird damage would include limited habitat manipulations and changes in cultural practices that are addressed in Chapter 4. Appendix B contains a discussion of the methods that would be available for use in an integrated approach under this alternative. The WS program also researches and actively develops methods to address bird damage through the NWRC. The NWRC functions as the research unit of WS by providing scientific information and by developing methods to address damage caused by animals. Research biologists with the NWRC work closely with wildlife managers, researchers, and others to develop and evaluate methods and techniques. For example, research biologists from the NWRC were involved with developing and evaluating the repellent mesurol for crows. Research biologists with the NWRC have authored hundreds of scientific publications and reports based on research conducted involving wildlife and methods.

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

Under this alternative, WS would provide those cooperators requesting assistance with technical assistance only. Technical assistance would 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 were of limited availability for use by private entities (*e.g.*, loaning of propane cannons). Similar to the proposed action alternative, a key component of assistance provided by WS would be providing information to the requester about wildlife and wildlife damage. Educational efforts conducted under the proposed action alternative would be similar to those conducted under this alternative.

Technical assistance would include collecting information about the species involved, the nature and extent of the damage, and previous methods that the cooperator had used to resolve the problem. WS would then provide 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. Generally, several management strategies would be described to the requester for short- and long-term solutions to managing damage based on the level of risk, need, and the practicality of their application. Only those methods legally available for use by the appropriate individual would be recommended or loaned by WS. Similar to Alternative 1, those methods described in Appendix B would be available to those persons experiencing damage or threats associated with birds in the State, except for alpha chloralose, DRC-1339, and mesurol, which are only available for use by WS.

Those entities seeking assistance with reducing damage could seek direct operational assistance from other governmental agencies, private entities, or conduct activities on their own. In situations where non-lethal methods were ineffective or impractical, WS could advise the property owner or manager of appropriate lethal methods to supplement non-lethal methods. In order for the property owner or manager to use lethal methods, they would be required to apply for their own depredation permit to take birds from the USFWS and/or the MDIFW, when a permit was required. WS could evaluate damage occurring or the threat of damage and complete a Migratory Bird Damage Report, which would include information on the extent of the damages or risks, the number of birds present, and a recommendation for the number of birds that should be taken to best alleviate the damage or the threat of damage. Following review by the USFWS of a complete application for a depredation permit from a property owner or manager and the Migratory Bird Damage Report, a depredation permit could be issued to authorize the lethal take of a specified number of birds.

This alternative would place the immediate burden of using methods to alleviate damage on the resource owner, other governmental agencies, and/or private businesses. Those entities 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.

Alternative 3 – No Bird Damage Management Conducted by WS

This alternative would preclude any activities by WS to reduce threats to human health and safety, and alleviate damage to agricultural resources, property, and natural resources. WS would not be involved with any aspect of bird damage management in the State. All requests for assistance received by WS to resolve damage caused by birds would be referred to the USFWS, to the MDIFW, and/or to private entities. This alternative would not deny other federal, state, and/or local agencies, including private entities, from conducting damage management activities directed at alleviating damage and threats associated with birds in the State. Therefore, under this alternative, entities seeking assistance with addressing damage caused by birds could contact WS but WS would immediately refer the requester to other entities. The requester could then contact other entities for information and assistance, could take actions to alleviate damage without contacting any entity, or could take no further action.

Many of the methods listed in Appendix B would be available for use by other agencies and private entities to manage damage and threats associated with birds. All methods described in Appendix B would be available for use by those persons experiencing damage or threats, except for the use of DRC-1339 for blackbirds, pigeons, and gulls, the use of alpha chloralose for waterfowl, and mesurol for crows.

3.2 ALTERNATIVES CONSIDERED BUT NOT ANALYZED IN DETAIL WITH RATIONALE

In addition to those alternatives identified in Section 3.1, several alternatives were also identified during the scoping process by the interagency team. The following issues were identified and considered but will not be analyzed in detail for the reasons provided:

Non-lethal Methods Implemented by WS before Lethal Methods

This alternative would require that 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 non-lethal methods failed to resolve the damage situation or reduce threats to human safety at each damage situation, lethal methods would be employed to resolve the request. Non-lethal methods would be applied to every request for assistance regardless of severity or intensity of the damage or threat until deemed inadequate to resolve the request. This alternative would not prevent the use of lethal methods by those persons experiencing bird damage.

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

Use of 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 Maine. 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 when permitted by the USFWS and/or the MDIFW, when required. The non-lethal methods that could be employed or recommended by WS under this alternative would be identical to those identified in any of the alternatives. Non-lethal methods would be employed by WS in an integrated approach under this alternative.

Since the destruction of active nests is often considered a non-lethal method, the take of nests and eggs could occur under this alternative. Since the destruction of nests and eggs is prohibited by the MBTA, the USFWS and the MDIFW would still be required to issue depredation permits for the take of bird nests under this alternative, when required. The USFWS and the MDIFW could continue to issue depredation permits to those persons experiencing damage or threats associated with birds under this alternative. Therefore, the lethal take of birds could continue to occur under this alternative. The number of nests of each species of birds addressed in this EA that would be destroyed to address damage and threats under this alternative would likely be similar to the levels analyzed under the proposed action.

Exclusionary devices can be effective in preventing access to resources in certain circumstances. The primary exclusionary methods are netting and overhead lines. Exclusion is most effective when applied to small areas to protect high value resources. However, exclusionary methods are neither feasible nor effective for protecting human safety, agricultural resources, or native wildlife species from birds across large areas. The non-lethal methods used or recommended by WS under this alternative would be identical to those methods identified in any of the alternatives. WS would not apply for a depredation permit from the USFWS under this alternative since no take of birds would occur unless nests or eggs were destroyed, when required.

In situations where non-lethal methods were impractical or ineffective to alleviate damages, WS could refer requests for information regarding lethal methods to the MDIFW, the USFWS, local municipalities, 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. The USFWS needs professional recommendations on individual damage situations before issuing a depredation permit for lethal methods, and the USFWS does not have the mandate or resources to conduct activities related to wildlife damage management. State agencies with responsibilities for migratory birds would likely have to provide this information if depredation permits were to be issued. If the information were provided to the USFWS, following the agency’s review of a complete application package for a depredation permit from a property owner or manager to lethally take birds, the permit issuance procedures would follow that described in the proposed action/no action alternative.

Property owners or managers could conduct management using any non-lethal or lethal method that was legal, once a permit had been issued for lethal take, when required. 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 the lack of WS' assistance with the full range of methods 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 USFWS may authorize more lethal take than was necessary to alleviate bird damages and conflicts because agencies, businesses, and organizations may have less technical knowledge and experience managing wildlife damage than WS.

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 caused by 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.

This alternative was not analyzed in detail since the take of birds and the destruction of nests could continue at the levels analyzed in the proposed action alternative. The USFWS and the MDIFW could permit the take despite WS' lack of involvement in the action. In addition, limiting the availability of methods under this alternative to only non-lethal methods could be inappropriate when attempting to address threats to human safety expeditiously, primarily at airports.

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. 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 some bird damage. For example, the use of non-lethal methods has been effective in dispersing urban crow roosts and vulture roosts (Avery et al. 2002, Seamans 2004, Avery et al. 2008, Chipman et al. 2008). In those situations where damage could be alleviated using non-lethal methods deemed effective, those methods would be employed or recommended as determined by the WS Decision Model. Therefore, this alternative was not considered in detail.

Trap and Translocate Birds Only by WS

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

The translocation of birds causing damage or posing a threat of damage to other areas following live-capture generally would not be effective or cost-effective. Translocation is generally ineffective because problem bird species are highly mobile and can easily return to damage sites from long distances, habitats in other areas are generally already occupied, and translocation would most likely result in bird damage problems at the new location. In addition, hundreds or thousands of birds would need to be captured and translocated to solve some damage problems (*e.g*., urban bird roosts); therefore, translocation would be unrealistic in those circumstances. Translocation of wildlife is also discouraged by WS policy (see 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).

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 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 through sterilization (permanent) or contraception (reversible). Sterilization could be accomplished through: 1) surgical sterilization (vasectomy, castration, and tubal ligation), 2) chemosterilization, and 3) 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 effective 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 reproductive 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 inhibitor becomes available to manage a large number of bird populations and proven effective in reducing localized bird populations, the use of the inhibitor could be evaluated as a method available under the alternatives. This EA would be reviewed and supplemented to the degree necessary to evaluate the use of the reproductive inhibitor. Currently, the only reproductive inhibitor registered with the EPA is nicarbazin, which is registered for use to manage local populations of Canada geese, domestic mallards, Muscovy ducks, other feral waterfowl, and rock pigeons. However, the only reproductive inhibitor available in Maine at the time this EA was developed was nicarbazin to manage local rock pigeon populations. Reproductive inhibitors for the other bird species addressed in this EA do not currently exist.

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) 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.

3.3 STANDARD OPERATING PROCEDURES FOR BIRD DAMAGE MANAGEMENT

WS' directives and SOPs improve the safety, selectivity, and efficacy of those methods available to resolve or prevent damage. WS' directives and SOPs would be incorporated into activities conducted by WS when addressing bird damage and threats.

Some key SOPs pertinent to the alternatives include the following:

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

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

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

- Non-target animals captured in traps would be released unless it was determined that the animal would not survive and/or that the animal could not be released safely.

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

- Management actions would be directed toward specific species or individual animals posing a threat to human health and safety, causing agricultural damage, causing damage to natural resources, or causing damage to property.

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

- WS consulted with USFWS and MDIFW to ensure activities do not jeopardize the existence of T&E species.

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

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

- Only non-toxic shot would be used when employing shotguns pursuant to 50 CFR 20.21(j).

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

3.4 ADDITIONAL STANDARD OPERATING PROCEDURES SPECIFIC TO THE ISSUES

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

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

- Lethal take of birds by WS would be reported and monitored by WS and by the USFWS to evaluate population trends and the magnitude of cumulative take of birds in the State.

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

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

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

- Preference would be given to non-lethal methods, when practical and effective.

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

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

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

- WS' personnel would use bait, trap placement, and capture devices that were strategically placed at locations likely to capture a target animal and minimize the potential of non-target animal captures.

- Any non-target animals captured in cage traps, nets, or any other restraining device would be released whenever it was possible and safe to do so.

- Carcasses of birds retrieved after damage management activities had been conducted would be disposed of in accordance with WS Directive 2.515.

- Personnel would be present during the use of live-capture methods or live-traps would be checked frequently to ensure non-target species were released immediately or were 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 MDIFW to evaluate activities to resolve bird damage and threats to ensure the protection of T&E species.

- WS would 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.

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

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

- The use of firearms would occur during times when public activity and access to the control areas was restricted, when possible. Personnel involved in the use of firearms would be fully trained in the proper and safe application of this method.

- All personnel employing chemical methods would be properly trained and certified in the use of those chemicals. All chemicals used by WS would be securely stored and properly monitored to ensure the safety of the public. WS' use of chemicals and training requirements for those chemicals are outlined in WS Directive 2.401 and WS Directive 2.430.

- All chemical methods used by WS or recommended by WS would be registered with the FDA, EPA, and the Maine Department of Agriculture, Food and Rural Resources, when applicable.

- Carcasses of birds retrieved after damage management activities would be disposed of in accordance with WS Directive 2.515.

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

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

Issue 4 - Effectiveness of Damage Management Methods

- The appropriateness and effectiveness of methods and techniques would be applied based on the WS Decision Model using site-specific inputs.

- WS would continually monitor the results of methods employed to ensure those methods deemed appropriate and most effective are used to resolve bird damage.

Issue 5 - 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 would be given to non-lethal methods, when practical and effective under WS Directive 2.101.

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

Issue 6 - Humaneness and Animal Welfare Concerns of Methods

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

- WS' personnel would be present during the use of most live-capture methods (*e.g.*, mist nets, cannon nets, rocket nets) to ensure birds captured were addressed in a timely manner to minimize the stress of being restrained.

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

- The NWRC would continue to conduct research to improve the selectivity and humaneness of methods and techniques used by personnel in the field.

- Preference would be given to non-lethal methods, when practical and effective under WS Directive 2.101.

Issue 7 – 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 causing damage, identified as posing a threat to human safety, or identified as posing a threat of damage.

- Preference would be given to non-lethal methods, when practical and effective under WS Directive 2.101.

- Damage management activities would only occur after a request for assistance is received by WS.

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

- WS' lethal removal of birds would be reported to and monitored by the USFWS and/or the MDIFW to ensure WS' take was considered as part of management objectives for those bird species in the State.

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

- WS would continue to recommend the use of hunting to address local populations in areas where hunting was permitted, when appropriate.

CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

Chapter 4 provides information needed for making informed decisions in selecting the appropriate alternative to address the need for action described in Chapter 1 and the issues described in Chapter 2. This chapter analyzes the environmental consequences of each alternative as those alternatives relate to the issues identified. The following resource values 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. Those resources will not be analyzed further.

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

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 MDIFW, and the USFWS.

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

A common issue is whether damage management actions would adversely affect the populations of target bird species, especially when lethal methods were employed. WS would maintain ongoing contact with the USFWS and the MDIFW to ensure activities occurred within management objectives for those species. WS would submit annual activity reports to the USFWS. The USFWS would monitor the total take of birds from all sources and would factor in survival rates from predation, disease, and other mortality data. Ongoing contact with the USFWS and the MDIFW would assure local, state, and regional knowledge of bird population trends were considered.

As discussed previously, methods available to address bird damage or threats of damage in the State that would be available for use or recommendation by WS under Alternative 1 (technical and operational assistance) and Alternative 2 (technical assistance only) would be either lethal methods or non-lethal methods. Under Alternative 2, WS could recommend lethal and non-lethal methods as part of an integrated approach to resolving requests for assistance but would provide no direct operational assistance. Alternative 1 addresses requests for assistance received by WS through technical and operational assistance where an integrated approach to methods could be employed and/or recommended. Non-lethal methods would include, but would not be limited to habitat/behavior modification, lure crops, visual deterrents, lasers, live traps, translocation, alpha chloralose, nest/egg destruction, exclusionary devices, frightening devices, nets, and chemical repellents (see Appendix B for a complete list and description of potential methods). Lethal methods considered by WS to address bird damage include live-capture followed by euthanasia, DRC-1339, shooting, and the recommendation of hunting, where appropriate. Target birds would be euthanized using cervical dislocation or carbon dioxide once birds were live-captured using other methods. Carbon dioxide is an acceptable form of euthanasia for birds while cervical dislocation is a conditionally acceptable method of euthanasia (AVMA 2013). No assistance would be provided by WS under Alternative 3 but many of those methods available to address bird damage would continue to be available for use by other entities under Alternative 3.

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 (see 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. For example, if a cooperator requesting assistance had already used non-lethal methods, WS would not likely recommend or continue to employ those particular methods since their use had already been proven ineffective in adequately resolving the damage or threat. Non-lethal methods would be used to exclude, harass, and disperse target wildlife from areas where damage or threats were occurring. When effective, non-lethal methods would disperse birds from the area resulting in a reduction in the presence of those birds at the site where those methods were employed.

The use of non-lethal methods in an integrated approach has proved effective in dispersing birds. For example, Avery et al. (2002) and Seamans (2004) found that the use of vulture effigies were an effective non-lethal method to disperse roosting vultures. Non-lethal methods have been effective in dispersing crow roosts (Gorenzel et al. 2000, Chipman et al. 2008), including the use of crow effigies (Avery et al. 2008), lasers (Gorenzel et al. 2002), and electronic distress calls (Gorenzel and Salmon 1993). Chipman et al. (2008) found the use of only non-lethal methods to disperse urban crow roosts often requires a long-term commitment of affected parties, including financial commitments, to achieve and maintain the desired result of reducing damage.

However, those species would be moved to other areas with minimal effects on those species' populations. Non-lethal methods would generally be regarded as having minimal effects on overall populations of target bird species since those birds would be unharmed. Non-lethal methods would not be employed over large geographical areas or applied at such intensity that essential resources (*e.g.*, food sources, habitat) would be unavailable for extended durations or over such a wide geographical scope that long-term adverse effects would occur to a species' population. The continued use of non-lethal methods often leads to the habituation of birds to those methods, which can decrease the effectiveness of those methods (Avery et al. 2008, Chipman et al. 2008). For any management methods employed, the proper timing would be essential in effectively dispersing those birds causing damage. Employing methods soon after damage begins or soon after threats were identified would increase the likelihood that those damage management activities would achieve success in addressing damage. Therefore, coordination and timing of methods is necessary to be effective in achieving expedient resolution of bird damage. The use of non-lethal methods would not have adverse impacts on populations of birds in the State under any of the alternatives.

Lethal methods would be employed or recommended to resolve damage associated with those birds identified by WS as responsible for causing damage or threats to human safety only after receiving a request for the use of those methods. The use of lethal methods could result in local population reductions in the area where damage or threats were occurring since birds would be removed from the population. Lethal methods are often employed to reinforce non-lethal methods and to remove birds that have been identified as causing damage or posing a threat to human safety. The use of lethal methods would result in local reductions of birds in the area where damage or threats were occurring. The number of birds removed from the population using lethal methods would be dependent on the number of requests for assistance received, the number of birds involved with the associated damage or threat, and the efficacy of methods employed.

Most lethal methods are intended to reduce the number of birds present at a location since a reduction in the number of birds at a location leads to a reduction in damage, which would be applicable whether using lethal or non-lethal methods. The use of lethal methods has been successful in reducing bird damage (Boyd and Hall 1987, Gorenzel et al. 2000). The intent of non-lethal methods is to harass, exclude, or otherwise make an area unattractive to birds, which disperses those birds to other areas; thereby, leading to a reduction in damage at the location where those birds were dispersed. The intent of using lethal methods would be similar to the objective trying to be achieved when using non-lethal methods, which would be to reduce the number of birds in the area where damage was occurring; thereby, leading to a reduction in the damage occurring at that location.

Although the use of firearms can reduce the number of birds using a location (similar to dispersing birds), the use of a firearm would most often be used to supplement and reinforce the noise associated with non-lethal methods (*e.g.*, pyrotechnics). The capture of birds using live-traps and subsequently euthanizing those birds would be employed to reduce the number of birds using a particular area where damage was occurring. Similarly, the recommendation that birds be harvested during the regulated hunting season for those species in the State would be intended to manage those populations in an area where damage was occurring.

The avicide DRC-1339 could also be used under the proposed action and applied as part of an integrated approach. The intent in using DRC-1339 would be to reduce the number of birds present at a location where damages or threats of damage were occurring. Reducing the number of birds at a location where damage or threats were occurring either using non-lethal methods or lethal methods could lead to a reduction in damage. The dispersal of birds using non-lethal methods can reduce the number of birds using a location, which has been correlated with a reduction in damage occurring at that location (Avery et al. 2008, Chipman et al. 2008). This scenario could occur if lethal methods were employed. Similarly, the use of DRC-1339 is intended to reduce the number of birds using a location. Boyd and Hall (1987) found the use of DRC-1339 to reduce local crow roosts by up to 25% could lead to a reduction in damage associated with those crows.

Often of concern with the use of lethal methods is that birds that are lethally taken would only be replaced by other birds either during the application of those methods (from other birds that move into the area) or by birds the following year (increase in reproduction that could result from less competition for limited resources). As stated previously, lethal methods that would be available for use are not intended to be population management tools over broad areas. The use of lethal methods, including the use of DRC-1339, would be intended to reduce the number of birds present at a location where damage was occurring by targeting those birds causing damage or posing threats. Therefore, the intent of lethal methods would be to manage those birds causing damage and not to manage entire bird populations.

Chipman et al. (2008) found that crows returned to roosts previously dispersed using non-lethal methods within two to eight weeks. In addition, Chipman et al. (2008) found that the use of non-lethal methods had to be re-applied every year during a six-year project that evaluated the use of only non-lethal methods. At some roost locations, Chipman et al. (2008) found the number of crows that returned each year to roosts over a six-year period actually increased despite the use of non-lethal methods each year. Despite the need to re-apply non-lethal methods yearly, the return of birds to roost locations previously dispersed, and the number of crows using roost locations increasing annually at some roost locations, Chipman et al. (2008) determined the use of non-lethal methods could be effective at dispersing urban crow roosts in New York. Similar results were found by Avery et al. (2008) during the use of crow effigies and other non-lethal methods to disperse urban crow roosts in Pennsylvania. Crows returned to roost locations in Pennsylvania annually despite the use of non-lethal methods and effigies (Avery et al. 2008). Gorenzel et al. (2002) found that crows returned to roost locations after the use of lasers. Therefore, the use of both lethal and non-lethal methods may require repeated use of those methods. The return of birds to areas where damage management methods were previously employed does not indicate previous use of those methods were ineffective since the intent of those methods would be to reduce the number of birds present at a site where damage was occurring at the time those methods were employed.

Most lethal and non-lethal methods currently available provide only short-term benefits when addressing bird damage. Those methods are intended to reduce damage occurring at the time those methods are employed but do not necessarily ensure birds would not return once those methods are discontinued or the following year when birds return to an area. Long-term solutions to resolving bird damage are often difficult to implement and can be costly. In some cases, long-term solutions involve exclusionary devices, such as wire grids, or other practices such as closing garbage cans. When addressing bird damage, long-term solutions generally involve modifying existing habitat or making conditions less attractive to birds. To ensure complete success, alternative sites in areas where damage is not likely to occur are often times required to achieve complete success in reducing damage and avoid moving the problem from one area to another. Modifying a site to be less attractive to birds would likely result in the dispersal of those birds to other areas where damage could occur or could result in multiple occurrences of damage situations.

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 MDIFW 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.

As discussed previously, the analysis for magnitude of impact from lethal take can be determined either quantitatively or qualitatively. Quantitative determinations are based on population estimates, allowable harvest levels, and actual harvest data. Qualitative determinations are based on population trends and harvest trend data. 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. The issue of the potential impacts of conducting the alternatives on the populations of target bird species is analyzed for each alternative below.

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

Under the proposed action, WS would continue to provide both technical assistance and direct operational assistance to those persons requesting assistance with managing damage and threats associated with birds in the State. WS would work with those persons experiencing bird damage to address those birds responsible for causing damage as expeditiously as possible. To be most effective, damage management activities should begin as soon as birds begin to cause damage. Bird damage that has been ongoing could be difficult to resolve using available methods since birds would be conditioned to feed, roost, loaf, and would be familiar with a particular location. Subsequently, making that area unattractive using available methods could be difficult to achieve once damage was ongoing. WS would work closely with those entities requesting assistance to identify situations where damage could occur and begin to implement damage management activities under this alternative as early as possible to increase the likelihood of those methods achieving the level of damage reduction requested by the cooperating entity. WS would employ and/or recommend those methods described in Appendix B in an adaptive approach that would integrate methods to reduce damage and threats associated with birds in the State. Under the proposed action alternative, WS could employ only non-lethal methods when determined to be appropriate for each request for assistance to alleviate damage or reduce threats of damage using the WS Decision Model.

However, could also use or recommend the use of lethal methods under this alternative. When employing lethal methods, a depredation permit may be required from the USFWS and/or the MDIFW.

The USFWS could issue depredation permits to WS and to those entities experiencing bird damage when requested and when deemed appropriate by the USFWS for those species that require a permit. When applying for a depredation permit, the requesting entity would submit with the application the number of birds requested to be taken to alleviate the damage. Therefore, under this alternative, the USFWS could: 1) deny an application for a depredation permit when requested to alleviate bird damage, 2) could issue a depredation permit at the take levels requested, or 3) could issue permits at levels below those take levels requested. The MDIFW could issue a permit to take the same number of birds authorized by the USFWS or the MDIFW could issue a permit authorizing the lethal removal of less than the number permitted by the USFWS. However, the take authorized by the MDIFW cannot exceed the take level authorized by the USFWS.

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

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

Under this alternative, WS would submit an application to the USFWS for a one-year depredation permit in anticipation of receiving requests for assistance to manage bird damage. The application submitted by WS would estimate the maximum number of birds of each species that could be lethally removed as part of an integrated approach. When submitting an application for a depredation permit each year, WS would use adaptive management principles to adjust the requested number of birds that could be lethally removed. Adjustments on the requested lethal take levels would be made based on anticipated needs using activities conducted previously as a guide. WS would not submit a Migratory Bird Damage Report as part of the application process. The USFWS would conduct an independent review of the application, and if acceptable, would issue a permit as allowed under the depredation permit regulations. WS could request an amendment to a permit to increase the number of birds that could be taken to address unpredicted and emerging damage or threats.

Therefore, the USFWS could: 1) deny WS' application for a depredation permit, 2) issue a depredation permit for the take of birds at a level below the number requested by WS, or 3) issue a depredation permit for the number of birds requested by WS. In addition, WS could be listed as subpermittees under depredation permits issued to other entities. The 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; however, the primary concern would be from the use of lethal methods to address damage. The lethal take of birds would be monitored by comparing numbers of animals killed with overall populations or trends in populations to assure the magnitude of take is maintained below the level that would cause significant adverse 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.

Double-crested Cormorant Biology and Population Impact Analysis

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 effects 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 management need to address those concerns (USFWS 2003, USFWS 2009*a*).

The double-crested cormorant is one of six species of cormorants breeding in North America and has the widest range (Hatch 1995). Double-crested cormorants range throughout North America, from the Atlantic coast to the Pacific coast (USFWS 2003). During the last 20 years, the cormorant population has expanded to an estimated 372,000 nesting pairs with the population (breeding and non-breeding birds) in the United States estimated to be greater than 1 million birds (Tyson et al. 1999). The USFWS estimated the continental population at approximately 2 million cormorants during the development of the cormorant management FEIS (USFWS 2003). Tyson et al. (1999) found that the cormorant population increased about 2.6% annually during the early 1990s. The greatest increase was in the Interior region, which was the result of a 22% annual increase in the number of cormorants in Ontario and those states in the United States bordering the Great Lakes (Tyson et al. 1999). From the early 1970s to the early 1990s, the Atlantic population of cormorants increased from about 25,000 pairs to 96,000 pairs (Hatch 1995). While the number of cormorants in this region declined by 6.5% in the early to mid-1990s, some populations were still increasing during this period (Tyson et al. 1999). The number of breeding pairs of cormorants in the Atlantic and Interior population was estimated at over 85,510 and 256,212 nesting pairs, respectively (Tyson et al. 1999).

Cormorants are most commonly found in Maine during the spring, summer, and fall months when the breeding and migrating populations are present (Wires et al. 2001, USFWS 2003). Those cormorants found in Maine during those periods are composed of birds from the Atlantic populations of cormorants (Tyson et al. 1999, USFWS 2003). Breeding populations of cormorants in Maine occur primarily along the coast, as only one inland nesting population currently exists (B. Allen, MDIFW pers. comm. 2012). Breeding habitat includes lakes, rivers, swamps, and seacoasts where nesting can occur on the ground, in trees, and on coastal cliffs (MANEM Waterbird Management Plan 2006). The number of cormorants observed in the State along routes surveyed during the BBS has shown a declining trend since 1966 estimated at -1.2% annually, with a -1.3% annual decline occurring from 2001 through 2011 (Sauer et al. 2012). In the Eastern BBS Region, the number of cormorants observed during the BBS has shown an increasing trend estimated at 3.6% annually since 1966, with an 10.8% annual increase occurring from 2001 through 2011 (Sauer et al. 2012). Cormorants observed in the Atlantic Northern Forest (BCR 14) have also shown an increasing trend estimated at 3.4% annually since 1966, with a 7.8% annual increase occurring from 2001 through 2011 (Sauer et al. 2012). Since 1966, the number of cormorants observed during the CBC has shown a general increasing trend in the State (NAS 2010) but only a minimal number of cormorants have been observed during the CBC. For example, during the survey conducted in 2011, 10 cormorants were observed in areas surveyed during the CBC (NAS 2010). As stated previously, the number of cormorants present in the State fluctuates throughout the year with the highest numbers occurring during the migration periods and during the breeding season.

To address cormorant damage to aquaculture resources and other resources, the USFWS, in cooperation with WS, prepared a FEIS that evaluated alternative strategies to managing cormorant populations in the United States (USFWS 2003). The selected alternative in the FEIS modified the existing AQDO and established a PRDO that allow for the take of cormorants without a depredation permit when cormorants are committing or about to commit damage to those resource types. The modified AQDO allows cormorants to be taken in 13 States without a depredation permit to reduce depredation on aquaculture stock at private fish farms and state and federal fish hatcheries but does not include aquaculture facilities in Maine (see 50 CFR 21.47). The PRDO allows for the take of cormorants without a depredation permit in 24 states when those cormorants cause or pose a risk of adverse effects to public resources (*e.g.*, fish, wildlife, plants, and their habitats) but does not include public resources in Maine (see 50 CFR 21.48). All take of cormorants in Maine to alleviate damage or the threat of damage requires a depredation permit issued by the USFWS.

The cormorant management FEIS developed by the USFWS predicted the number of cormorants taken by authorized entities under the PRDO would increase by 4,140 cormorants per State above the take level that had occurred previously in each of the 24 States covered under the PRDO (USFWS 2003). The FEIS estimated that authorized entities would take 99,360 cormorants annually pursuant to the PRDO in those 24 States where take would be authorized (USFWS 2003). The cormorant management FEIS developed by the USFWS estimated the number of cormorants lethally taken under an alternative implementing a PRDO, an expanded AQDO, and under depredation permits would increase to 159,635 cormorants taken annually (USFWS 2003). The FEIS determined the lethal take of up to 159,635 cormorants annually under the depredation orders and under permits would represent approximately 8.0% of the continental cormorant population.

The take of cormorants from 2004 through 2011 under the depredation orders and under depredation permits in the 24 States included in the PRDO are shown in Table 4.1. Between 2004 and 2011, an average of 40,844 cormorants have been taken under the two depredation orders (PRDO and AQDO) and under depredation permits issued by the USFWS in those 24 States authorized to take cormorants. The USFWS (2009*a*) estimated the take of cormorants under the depredation orders and depredation permits involved primarily those cormorants that were considered a part of the Interior cormorant population. Those cormorants found in Maine are considered part of the Atlantic population of cormorants (Tyson et al. 1999).

Table 4.1 – Double-crested cormorant take in the 24 States included in the PRDO*

Year	Take by Depredation Order or Permit		Total Take
	PRDO	AQDO and Permits	
2004	2,395	27,882	**30,277**
2005	11,221	23,869	**35,090**
2006	21,428	32,617	**54,045**
2007	19,960	18,818	**38,778**
2008	18,782	21,523	**40,305**
2009	25,562	20,192	**45,754**
2010	18,363	19,516	**37,879**
2011	28,473	16,146	**44,619**
2012	26,112	N/A[†]	**N/A**

[*]preliminary take data provided by the USFWS

†N/A=data is currently unavailable

As shown in Table 4.1, the annual take of cormorants from 2004 through 2011 has not exceeded 159,635 cormorants in any given year. The highest level of cormorant take occurred in 2006 when 54,045 cormorants were lethally taken, which represents 34.3% of the 159,635 cormorants evaluated in the cormorant management FEIS. The FEIS determined an annual take of 159,635 cormorants would be sustainable at the State, regional, and national level (USFWS 2003, USFWS 2009*a*). The take that has occurred since the implementation of the preferred alternative in the FEIS that created a PRDO and modified the existing AQDO, has only reached a high of 34.3% of the level evaluated in the FEIS, which determined the higher level of take would be sustainable at the State, regional, and national level. Upon further evaluation, the USFWS determined the implementation of the preferred alternative in the FEIS that has allowed the annual take level of cormorants under the PRDO, the AQDO, and under depredation permits had not reached a level where undesired adverse effects to cormorant populations would occur (USFWS 2009*a*). The USFWS subsequently extended the expiration dates of the PRDO and the current AQDO (USFWS 2009*a*).

In addition, the USFWS determined the destruction of nests, including the destruction of eggs, allowed under the PRDO and under permits would not reach a level where an undesired decline in the cormorant populations would occur (USFWS 2003). The USFWS further evaluated nest destruction activities from 2004 through 2008 and determined the number of nests destroyed since 2004 and the continued destruction of nests evaluated in the FEIS would not reach a magnitude that would cause undesired declines in cormorant populations (USFWS 2009*a*).

Bird band recovery models have been developed to estimate temporal trends in hatch-year, second-year, and after second-year survival of cormorants banded in the Great Lakes region from 1979 through 2006 (Seamans et al. 2008). The period evaluated encompassed the period of rapid cormorant population increase in the Great Lakes, the establishment of the AQDO in 1998 by the USFWS, and the establishment of the PRDO and changes to the AQDO implemented in 2003 by the USFWS. Survival in hatch-year birds decreased throughout the study period. In addition, survival was negatively correlated with abundance estimates for cormorants in the Great Lakes area. The decline may have been related to density-dependent factors. However, there was also evidence that the depredation orders were contributing to the decreasing survival in hatch-year birds. The data was unclear on whether the depredation orders were reducing the survival of second-year or after-second year cormorants even though lethal removal of cormorants in the Great Lakes increased after the implementation of the depredation orders. Seamans et al. (2008) found that the survival rates of second-year and after second-year cormorants did decrease from 2004 through 2006 based on banding data, but survival rates for those two age classes were still within the range observed for previous years. Additional time may be required before the models used by Seamans et al. (2008) detect any changes in mortality rates resulting from the establishment of the PRDO and the modification of the AQDO that occurred in 2003 due to a lag effect.

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).

Between 2007 and 2011, the highest level of cormorant take authorized in the State occurred in 2010 when the USFWS permitted that take of 486 cormorants in the State (see Table 4.2). In total, the USFWS has authorized, through the issuance of depredation permits, the take of 2,347 cormorants in the State between 2007 and 2011. However, the total take of cormorants by all entities issued depredation permits has been 294 cormorants between 2007 and 2011. Between FY 2007 and FY 2011, nine cormorants have been lethally taken by WS in the State. The highest level of take level occurred during FY 2011 when seven cormorants were lethally removed pursuant to depredation permits. In addition, WS has employed non-lethal methods to disperse 858 cormorants in the State to alleviate damage between FY 2007 and FY 2011.

The cormorants lethally taken during FY 2007 and FY 2009 were lethally taken unintentionally by WS in body-gripping traps employed to alleviate damage associated with other wildlife species. Although the cormorants lethally removed during FY 2007 and FY 2009 were unintentional non-targets, the take occurred within permitted levels allowed by the USFWS through the issuance of depredation permits to WS.

Although only limited cormorant damage management activities have been conducted by WS in Maine, WS anticipates the number of requests for assistance to manage damage caused by cormorants will increase based on the increasing number of cormorants observed in the region during the breeding season. If an increase in the number of requests for assistance occurs, under the proposed action, the number of cormorants lethally taken annually by WS would also likely increase to address those requests for assistance, likely to address threats occurring to natural resources. Threats to natural resources could occur if cormorants were competing with other colonial waterbirds for nest sites. Based on increasing trends in the number of cormorants in the region observed during the development of this EA, WS anticipates that up to 100 cormorants total could be lethally taken by WS annually to alleviate damage under depredation permits.

Table 4.2 – Number of double crested cormorants addressed in Maine from 2007 to 2011

Year	Dispersed by WS[1]	USFWS Authorized Take[2]	Take under Depredation Permits	
			WS' Take[1]	Total Take[2,3]
2007	250	460	1	37
2008	245	481	0	64
2009	100	481	1	64
2010	40	486	0	58
2011	223	439	7	71
TOTAL	**858**	**2,347**	**9**	**294**

[1]Data reported by federal fiscal year

[2]Data reported by calendar year

[3]Total take by all entities authorized under depredation permits issued by the USFWS

As stated previously, the cormorant management FEIS developed by the USFWS predicted the number of cormorants taken by authorized entities under just the PRDO would total 4,140 cormorants per State in each of the States included in the PRDO (USFWS 2003). The take under the PRDO would be in addition to take occurring under the AQDO and under depredation permits. Furthermore, the USFWS predicted through the analyses in the cormorant population management FEIS that the authorized take of cormorants and their eggs for the management of double-crested cormorant damage, including those taken in Maine, was anticipated to have no long-term adverse effects on regional or continental double-crested cormorant populations (USFWS 2003, USFWS 2009*a*). This includes cormorants that may be killed in the State under USFWS issued depredation permits. Cormorants are a long-lived bird and egg destruction programs are anticipated to have minimal effects on regional or continental cormorant populations (USFWS 2003, USFWS 2009*a*).

The average total take of cormorants under the PRDO, AQDO, and depredation permits from 2004 through 2011 has been 40,844 cormorants with the highest level of take occurring in 2006 when 54,045 cormorants were taken by all entities in the 24 States listed under the PRDO and AQDO (USFWS 2009*a*). The highest total take and the average annual take that has occurred by all entities covered under the PRDO and the AQDO from 2004 through 2011 is below the 160,000 cormorants taken annually addressed in the cormorant management FEIS.

WS' proposed take of up to 100 cormorants annually to address damage and threats fall within the parameters of take evaluated within the cormorant management FEIS (USFWS 2003, USFWS 2009*a*). If WS' anticipated take of up to 100 cormorants were included with the average take by all entities from 2007 through 2011, the combined take would be below the level of take analyzed in the FEIS. Although the USFWS could issue depredation permits to other entities in the State, when the permitting of the take occurs within the impacts parameters of the cormorant population management FEIS (USFWS 2003, USFWS 2009*a*), the cumulative take of cormorants in the State would not reach a level where undesired declines would occur.

Great Blue Heron Biology and Population Impact Analysis

Great blue herons are a common widespread wading bird that can be found throughout most of North America. In addition, great blue herons can be found throughout the year in most of the United States, including Maine (Butler 1992). Great blue herons are most often located in freshwater and brackish marshes, lakes, rivers, and lagoons (MANEM Waterbird Conservation Plan 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 (MANEM Waterbird Conservation Plan 2006). Great blue herons feed mainly on fish but they are also known to capture invertebrates, amphibians, reptiles, birds, and mammals (Butler 1992).

Most nesting great blue heron colonies in the northeastern United States occur along the coastal areas located in BCR 14 and BCR 30. Maine lies almost entirely within BCR 14 with only the extreme southeastern portion of the State lying within BCR 30. In BCR 14, the breeding population has been estimated at 12,000 herons while the breeding population in BCR 30 has been estimated at nearly 31,000 herons (MANEM Waterbird Conservation Plan 2006). The breeding populations of great blue herons in BCR 14 and BCR 30 have been given a conservation ranking of lowest concern (MANEM Waterbird Conservation Plan 2006). Between 1966 and 2011, the number of herons observed along routes surveyed in BCR 14 during the BBS has shown an increasing trend estimated at 0.2% annually, with a 1.1% annual increase occurring from 2001 through 2011 (Sauer et al. 2012).

Great blue herons are showing a statistically significant increase across all survey routes of the BBS. Since 1966, the number of great blue herons observed survey-wide has increased at an annual rate of 0.8%, with a 1.6% annual increase occurring from 2001 through 2011 (Sauer et al. 2012). In Maine, herons observed on BBS routes are showing a statistically significant downward trend estimated at -2.5% annually from 1966 through 2011, with a 2.8% annual decline occurring from 2001 through 2011 (Sauer et al. 2012). During a 2009 survey, the MDIFW estimated that there were 1,071 great blue heron nests (430 coastal island nests and 641 inland nests) in the State of Maine (B. Allen, MDIFW pers. comm. 2012). Herons observed overwintering in Maine have shown a cyclical pattern but a general increasing trend has occurred since 1966 (NAS 2010). The cyclical pattern is likely due to the presence or absence of open water in Maine during the winter months, since herons need open water to forage.

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

From FY 2006 through FY 2011, WS has not received requests to provide direct operational assistance associated with great blue heron damage in the State and no herons have been addressed by WS in the State. However, the USFWS has issued depredation permits to other entities for the take of herons to alleviate damage or threats of damage. As shown in Table 4.3, 31 herons were lethally taken in the State by all entities to alleviate damage or threats associated with great blue herons from 2007 through 2011. The highest level of take occurred in 2007 when eight herons were lethally taken in the State pursuant to depredation permits issued by the USFWS. On average, six herons have been lethally taken in the State under depredation permits to alleviate damage or threats from 2007 through 2011.

To address requests for assistance to manage damage associated with great blue herons in the future, up to 20 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 previously, 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.

Table 4.3 – Number of great blue herons addressed in Maine from 2007 to 2011

Year	Dispersed by WS[1]	USFWS Authorized Take[2]	Take under Depredation Permits	
			WS' Take[1]	Total Take[2,3]
2007	0	10	0	8
2008	0	10	0	6
2009	0	10	0	7
2010	0	10	0	5
2011	0	16	0	5
TOTAL	**0**	**56**	**0**	**31**

[1]Data reported by federal fiscal year
[2]Data reported by calendar year
[3]Total take by all entities authorized under depredation permits issued by the USFWS

The average annual take of herons in the State by all entities has been six herons since 2007. If the average annual take of herons by other entities were reflective of take that could occur in the future, the combined WS' take and take by other entities would total 26 herons. When included with the highest heron take that occurred by all entities of eight herons in 2007, take of up to 20 herons by WS annually would total 28 herons lethally taken in the State. The USFWS has authorized take of up to 10 herons annually from 2007 through 2010, with 16 herons authorized in 2011. If 16 herons were removed by other entities, the combined take between WS and other entities would be 36 herons. According to the 2009 nest survey conducted by MDIFW, there were an estimated 1,071 great blue heron nests in Maine. Based on this survey, there would have been an estimated population of 2,142 breeding adult great blue heron in Maine in 2009. If 36 great blue herons were lethally removed by all entities, the removal would represent 1.6% of the estimated breeding adult population.

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

Turkey Vulture Biology and Population Impact Analysis

Turkey vultures can be found throughout Mexico, across most of the United States, and along the southern tier of Canada (Wilbur 1983, Rabenhold and Decker 1989). Turkey vultures can be found in virtually all habitats but vultures 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). Turkey vultures often roost in large groups near homes or other buildings where they can cause property damage from droppings or by pulling and tearing shingles. Turkey vultures prefer carrion but will eat virtually anything, including insects, fish, tadpoles, decayed fruit, pumpkins, and recently hatched heron and ibis chicks (Brauning 1992). Turkey vultures have been reported to live up to 16 years of age (Henny 1990).

Trending data from the BBS indicates the number of turkey vultures observed along BBS routes in the State have shown an increasing trend estimated at 9.0% annually from 1966 through 2011 (Sauer et al. 2012). The number of turkey vultures observed in areas surveyed in the State during the CBC has also shown an increasing trend (NAS 2010).

Rich et al. (2004) estimated the breeding population of turkey vultures at 1,400 vultures in BCR 14 and 16,000 vultures in BCR 30. The statewide population of turkey vultures is currently unknown but has been estimated at 200 turkey vultures based on BBS data (Rich et al. 2004). The population estimates provided by Rich et al. (2004) for some species are often poor due to high variance on BBS counts, low sample size, or due to other species-specific limitations of BBS methods. The population estimates published by Rich et al. (2004) were derived from BBS data for individual species. BBS data is derived from surveyors identifying bird species based on visual and auditory cues at stationary points along roadways. Vultures produce very few auditory cues that would allow for identification (Buckley 1999) and thus, surveying for vultures is reliant upon visual identification. For visual identification to occur during surveys vultures must be either flying or visible while roosting. Coleman and Fraser (1989) estimated that vultures spend 12 to 33% of the day in summer and 9 to 27% of the day in winter flying. Avery et al. (2011) found that turkey vultures were most active in the winter (January to March) and least active during the summer (July to September). Avery et al. (2011) found that across all months of the year, turkey vultures were in flight 18.9% of the daylight hours.

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 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. Avery et al. (2011) found turkey vulture flight activity peaked during the middle of the day. Three hours after sunrise, Avery et al. (2011) found only 10% of turkey vultures in flight. 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. Because 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 poor data quality ratings assigned by Rich et al. (2004) for the population estimate of turkey vultures in Maine. Given the limitations of current survey protocols, populations of vultures in Maine are likely higher than currently derived from survey data. As an example, Rich et al. (2004) estimated the black vulture population in Virginia at 5,000 vultures using BBS data. In comparison, Runge et al. (2009) estimated that there were over 91,000 black vultures in Virginia during 2006 using other biological models.

The take of turkey vultures is also prohibited under the MBTA except through the issuance of depredation permits issued by the USFWS. From 2007 through 2011, 28 turkey vultures have been lethally taken in the State by all entities to alleviate damage pursuant to depredation permits (see Table 4.4), which is an average of six vultures removed per year. The USFWS has authorized take of up to 80 turkey vultures a year in the State. The highest level of take occurred in 2008 when 11 vultures were lethally removed by other entities.

WS did not receive requests for direct operational assistance associated with turkey vultures from FY 2007 through FY 2011. However, WS anticipates receiving requests for assistance associated with turkey vultures in the future based on the increasing population trends. Future requests for assistance are likely to involve threats occurring at airports within the State and damages to property from groups of roosting vultures. In anticipation of receiving requests for assistance, WS could be requested to lethally remove vultures as part of an integrated approach under the proposed action alternative. Based on the roosting behavior of vultures and in anticipation of receiving requests for lethal removal of vultures, WS could lethally remove up to 50 vultures in the State to alleviate damage or threats pursuant to depredation permits issued by the USFWS.

Table 4.4 – Number of turkey vultures addressed in Maine from 2007 to 2011

Year	Dispersed by WS[1]	USFWS Authorized Take[2]	Take under Depredation Permits	
			WS' Take[1]	Total Take[2,3]
2007	0	75	0	6
2008	0	80	0	11
2009	0	58	0	3
2010	0	80	0	3
2011	0	80	0	5
TOTAL	**0**	**373**	**0**	**28**

[1]Data reported by federal fiscal year
[2]Data reported by calendar year
[3]Total take by all entities authorized under depredation permits issued by the USFWS

If up to 50 turkey vultures were taken annually by WS, WS' take would represent 25% of the estimated statewide population of turkey vultures estimated at 200 vultures if the population remains at least stable. The statewide population of turkey vultures is likely higher than 200 vultures for the reasons discussed previously; however, the exact population in the State is unknown. On average, six vultures have been taken annually by other entities in Maine between 2007 and 2011. When combined with a maximum take of 50 vultures annually by WS, the combined take would represent 28% of the estimated statewide population. If up to 50 turkey vultures were taken annually by WS, WS' take would represent 0.3% of the estimated population of turkey vultures in BCR 14 and BCR 30 estimated at 17,400 vultures if the population remains at least stable. The highest annual level of authorized take by the USFWS has been 80 vultures. If 80 vultures were actually taken and WS had lethally removed 50 vultures, the cumulative take would have been 130 vultures. When compared to the population estimated at 17,400 vultures in

BCR 14 and BCR 30, the cumulative take by all entities would represent 0.8% the estimated population in those two regions. The permitting of the take by the USFWS and the MDIFW pursuant to the MBTA would ensure take by WS and by other entities occurred within allowable take levels to achieve the desired population objectives for turkey vultures in the State.

Resident Canada Goose Biology and Population Impact Analysis

There are primarily four bird migration routes in North America, each of which has a Flyway Council governing migratory game bird management. Those councils are comprised of representatives from member States and Canadian Provinces that make recommendations to the USFWS on the management of waterfowl populations. The flyway system is divided into four administrative units; the Atlantic, Mississippi, Central, and Pacific Flyway Councils. The State of Maine is considered part of the Atlantic Flyway Council designated for the management of migratory birds, including Canada geese.

The WS program has received requests for assistance to manage damage and threats to human safety associated with Canada geese throughout the State of Maine. Depending on the time of year, there could be two behaviorally distinct Canada goose populations present in the State. The two distinct types of geese that could be present are generally termed "*resident*" and "*migratory*" geese.

Canada geese are considered residents when one of the following criteria are met: 1) nests and/or resides on a year round basis within the contiguous United States; 2) nests within the lower 48 States in the months of March, April, May, or June; or 3) resides within the lower 48 States and the District of Columbia in the months of April, May, June, July, and August (see 50 CFR 21.3; Rusch et al. 1995, Ankney 1996, USFWS 2005).

Banding studies have confirmed that resident geese in Maine are not geese that simply stopped migrating north to breed; they are distinct populations with very different population growth rates and management needs. Resident Canada geese are now the most numerous waterfowl population in the Atlantic Flyway, and concerns about their overabundance are widespread (Atlantic Flyway Council 2011).

Resident Canada geese become sexually mature and breed at two to three years of age with a relatively high nesting success compared to migrant Canada geese (USFWS 2005). The highest concentration of breeding Canada geese in Maine occurs in urban areas, but birds can be observed throughout the State. Resident Canada geese primarily nest from March through May each year. In Maine, resident Canada geese nest in traditional sites (along shorelines, on islands and peninsulas, small ponds, lakes, and reservoirs), as well as on rooftops, adjacent to roadways, swimming pools, and in parking lots, playgrounds, planters, and abandoned property (*e.g*., tires, automobiles). Those areas provide optimal habitat for Canada geese.

In Maine, resident Canada geese molt, and are flightless, from mid-June through mid-July each year. Molting is the process whereby geese annually replace their feathers, including their primary and secondary flight (wing) feathers (Welty 1982). Portions of a flock of geese can be flightless from about one week before to two weeks after the primary molt period due to the asynchronous molting by individual birds. Resident Canada geese that have failed nesting attempts sometimes move to other areas in late spring prior to molting (Nelson and Oetting 1998).

The first management plans for Canada geese in the Atlantic Flyway were developed in 1989, to help manage harvest and manage human/goose conflicts. The Atlantic Flyway Resident Canada Goose Management Plan outlined the main goals relating to Canada geese in the Atlantic Flyway (Atlantic Flyway Council 1999). The main subject areas covered in the Plan as they related to population management focused on population objectives, harvest management, and population control. Population objectives as outlined in the management plan were to reduce the resident Canada goose population in the Atlantic Flyway to 650,000 geese by 2005. The management objectives outlined in the 2011 Atlantic Flyway Resident Canada Goose Management Plan has a goal of reducing the population to 700,000 geese by the spring of 2020. To relieve damage and conflicts, the management plan recommended allowing a wide variety of effective and efficient options for damage relief, including the adoption of a federal depredation order or conservation order to allow States to manage goose populations. In addition, the plan recommended maximizing the opportunities for the use and appreciation of resident Canada geese that are consistent with population goals. The plan also called for the management of resident Canada goose populations to be compatible with management criteria established for migrant geese and to monitor populations, harvest, and conflict levels annually to evaluate the effectiveness of the management plan. One of the strategies outlined for meeting the objective recommended allowing capture and euthanasia of geese in problem areas (Atlantic Flyway Council 2011).

The USFWS and the States estimated the resident Canada goose population at 3.2 million in the United States; about 30% to 35% above the number States believe to be acceptable based on their needs to manage conflicts and problems caused by resident Canada geese (USFWS 2005). In the Atlantic Flyway, resident Canada geese consist of several subspecies that were introduced and established during the early 1900s after extirpation of native birds (Delacour 1954, Dill and Lee 1970, Pottie and Heusmann 1979, Benson et al. 1982). The spring 2012 estimate for the Atlantic Flyway resident Canada goose population was 879,800 geese, which was similar to the 2011 estimate (USFWS 2012) but was nearly 26% above the population objective recommended by the Atlantic Flyway Council in their resident Canada goose management plan (Atlantic Flyway Council 2011).

The number of resident Canada geese observed along routes surveyed in the State from 1966 through 2011 during the BBS has shown an increasing trend estimated at 14.9% annually (Sauer et al. 2012). Between 2001 and 2011, the upward trend has been estimated at 15.1% annually in the State (Sauer et al. 2012). In BCR 14, the number of geese observed along routes surveyed has shown an increasing trend since 1966 estimated at 16.1%, which is statistically significant. Across all routes surveyed in the United States, the number of geese observed has shown an increasing trend estimated at 10.7% annually since 1966, with a 15.8% annual increase occurring from 2001 through 2011 (Sauer et al. 2012).

As discussed previously, Canada geese are considered resident in the State when nesting and/or residing on a year round basis within the State, when nesting in the State during the months of March, April, May, or June, or residing in the State during the months of April, May, June, July, August (see 50 CFR 21.3; Rusch et al. 1995, Ankney 1996, USFWS 2005). Most requests for assistance received by WS occur under the criteria where geese present in the State would be considered resident. In 1999, the resident goose population in Maine was estimated at 48,000 geese (Atlantic Flyway Council 1999, USFWS 2005). In 1999, the population objective for resident Canada geese in the State was 15,000 individuals (Atlantic Flyway Council 1999, USFWS 2005).

As resident goose populations have increased across the United States, the number of requests for assistance to manage damage associated with geese has also increased (USFWS 2005). Under the selected alternative in the resident Canada goose FEIS developed by the USFWS, several mechanisms were established to allow the States to further manage resident goose populations and goose damage (USFWS 2005). An additional mechanism in place to address increasing resident goose populations was increased opportunities to address resident geese during regulated hunting seasons.

Canada geese can be harvested during regulated seasons in the State. Under frameworks developed by the USFWS, the MDIFW allows Canada geese to be harvested during a September hunting season and the regular waterfowl season. To manage increasing populations of resident geese across their range, the USFWS established a framework that allowed the States to implement a harvest season in September, which allows hunters to harvest resident geese specifically. During the September hunting season in 2010, an estimated 4,700 geese were harvested statewide (Raftovich et al. 2012). In 2011, the USFWS currently estimates that 1,700 geese were harvested in the State during the September season for geese (Raftovich et al. 2012). During the regular waterfowl season, an estimated 4,500 geese were harvested in the State during 2010 compared to 2,000 geese harvested in the 2011 (Raftovich et al. 2012).

The take of geese under the depredation orders discussed previously that allow for the take of Canada geese once certain conditions have been met must be reported to the USFWS. Therefore, the cumulative impacts of the proposed action on resident Canada geese populations would be based upon the anticipated WS' take, hunter harvest, and authorized take occurring by other entities (*e.g.*, agricultural producers, municipalities, homeowners associations, airports) through the issuance of depredation permits or under the depredation orders. The cumulative take of geese in Maine from 2007 through 2011 is shown in Table 4.5.

Most requests for assistance received by WS to address damage caused by Canada geese occurs during those months when geese present in the State are considered resident. From FY 2007 through FY 2011, WS received 193 requests for assistance to alleviate damage and human health threats from Canada geese. To alleviate damage, WS has lethally removed 14 geese, dispersed 512 geese using non-lethal methods, freed/released 98 geese, and translocated 161 Canada geese in Maine from FY 2007 through FY 2011.

Distinguishing resident and migratory geese is not possible through visual identification. However, based on those requests received and the type of damage occurring, most of the geese addressed by WS from FY 2007 through FY 2011 were likely resident geese (*i.e.*, present in the State all year). WS' take will be analyzed here as if all birds taken were resident geese. The majority of the take of geese by WS did occur from April through August between FY 2007 and FY 2011 when geese present in the State are likely resident. Only two geese were taken outside of the months of April through August, which occurred in 2010.

Table 4.5 – Cumulative Take of Canada Geese in Maine, 2007-2011

Year	WS' Take[1]	Hunter Harvest		Depredation Take[2]	Total Take
		September	Regular		
2007	1	3,400	5,700	28	**9,129**
2008	1	5,500	8,300	49	**13,580**
2009	0	1,600	3,100	48	**4,748**
2010	2	4,700	4,500	86	**9,288**
2011	10	1,700	2,000	91	**3,801**
TOTAL	**14**	**16,900**	**23,600**	**302**	**40,816**

[1]WS' take is reported by FY

[2]Depredation take is reported by calendar year

From 2007 through 2011, 16,900 geese were harvested in the State during the September hunting season intended to target resident populations of Canada geese. The highest level of take during the September season occurred during the 2008 season when 5,500 geese were harvested in the State. Based on a resident goose population of 48,000 geese estimated in Maine (Atlantic Flyway Council 1999, USFWS 2005), the take of 5,500 geese during the September season in 2008, which is intended to target resident geese, represented nearly 11.5% of the estimated statewide population. The take of geese by WS, the take of geese during the September season, and the take of geese under depredation permits and orders in the State are most likely geese that meet the criteria for resident geese. The percentage of geese that are taken during the regular waterfowl season and during the late season that would be considered resident geese in the State is unknown.

Based on previous requests for assistance, WS anticipates up to 500 resident and migratory geese could be lethally taken by WS annually in the State based on previous requests for assistance and in anticipation of additional efforts to address damage. As mentioned previously, those geese addressed by WS during those months when geese present in the State could be considered migratory will be considered migratory despite the possibility that some of the geese taken could be resident geese (*i.e.*, present in the State throughout the year). In addition, up to 300 nests/eggs could be destroyed by WS annually to alleviate damage or threats of damage.

WS' take of geese to alleviate damage from FY 2007 through FY 2011 represented 0.03% of the total take of geese that has occurred in the State from 2007 through 2011. WS' take of geese to alleviate damage has been a minor component of the total number of geese taken in the State during the regulated harvest seasons and the take of geese under depredation permits or depredation orders. The resident goose population goal for Maine is 15,000 geese (Atlantic Flyway Council 1999). The resident goose population in the State was estimated at 48,000 geese, which exceeds the population goal by 220%.

Under the proposed action, the nests and/or eggs of resident Canada geese could be destroyed by WS as part of an integrated approach to managing damage. Under the proposed action, up to 300 nests could be destroyed annually by WS. WS' take of nests and/or eggs would only occur when permitted by the USFWS through the issuance of depredation permits. WS' take of nests would not exceed 300 annually and would not exceed the level permitted under depredation permits.

Impacts due to nest and egg removal and destruction would have little adverse effect on the resident goose population in Maine. Nest and egg destruction methods are generally considered non-lethal when conducted before the development of an embryo. Additionally, geese are a long-lived species and have the ability to identify areas with regular human disturbance and low reproductive success, which causes them to relocate and nest elsewhere when confronted with repeated nest failure. Although there may be reduced fecundity for the individuals affected, this activity would not have a long-term effect on breeding adult geese when occurring at a localized level (USFWS 2005). Nest and egg removal would not be used by WS as a population management method. This method would be used by WS to inhibit nesting in an area experiencing damage due to the nesting activity and would be employed only at the localized level. Allan et al. (1995) estimated the treatment of 95% of all Canada goose eggs each year would result in only a 25% reduction in the population over 10 years. The resident Canada goose management FEIS developed by the USFWS concluded that a nest and egg depredation order would have minimal impacts on goose populations with only localized reductions in the number of geese occurring (USFWS 2005).

Based upon past requests for WS' assistance and in anticipated of additional efforts, WS anticipates that no more than 300 nests and 500 Canada geese total would likely be killed by WS annually under the proposed action. WS anticipates the number of requests to address damage associated with resident Canada geese will increase at airports, public drinking water sources, municipal parks, golf courses, public beaches, and other public use areas where geese congregate. All take of geese by WS would occur under depredation permits issued by the USFWS. Therefore, the take of geese by WS would be considered as part of the management objectives for geese in the State and across the flyway.

Based on the 1999 resident goose population estimate in the State of 48,000 geese, the take of 500 geese by WS would represent about 1.0% of the estimated statewide population, if all 500 geese were taken during the period when geese would be considered resident geese. Therefore, if the resident Canada goose population in the State remains stable, WS' take of up to 500 geese annually would not exceed 1.0% of the estimated population. As stated previously, the population goal in Maine is 15,000 resident Canada geese. The take of 500 geese by WS would represent 3.3% of the population goal if the goal is maintained or exceeded in the State. All take by WS would occur under depredation permits issued by the USFWS for the take of geese. WS' take of up to 500 geese annually would be dependent upon the USFWS authorizing the take at that level annually. Take by WS would not exceed the permitted take allowed under depredation permits issued by the USFWS. With management authority for migratory birds, the USFWS can adjust allowed take through the regulated harvest season and take under depredation permits and orders to meet population objectives. Therefore, all take by WS would be authorized by the USFWS and considered as part of population objectives for geese.

The reproductive inhibitor known as nicarbazin has been registered with the EPA for use to manage Canada goose and domestic waterfowl populations on a local scale by reducing the likelihood that eggs laid will hatch. Nicarbazin, as a reproductive inhibitor for geese and domestic waterfowl, has been registered with the EPA as a pesticide pursuant to the FIFRA under the trade name OvoControl® G (Innolytics, LLC, Rancho Sante Fe, CA). Label requirements of OvoControl® G restrict the application of the product to urban areas, which limits the extent of the products use for reducing localized waterfowl populations. Based on current information, WS' use or recommendation of nicarbazin formulated under the trade name OvoControl® G would not adversely affect resident goose populations in Maine since WS' activities would not be additive to those activities that could occur in the absence of WS' use of the product. Given that the effects of nicarbazin would only be temporary if birds were not fed an appropriate dose of nicarbazin daily, the reduction in the population could be fully reversed if treated bait was no longer supplied and other conditions (*e.g.*, food, disease) were favorable for population growth.

Migratory Canada Goose Biology and Population Impact Analysis

Canada geese are endemic to North America, where they occur in each State of the United States (except Hawaii), each Province of Canada, and many States of Mexico. Migrant geese nest across the arctic, subartic, and boreal regions of Canada and Alaska and are present in the conterminous United States during the winter. In the past, most authorities recognized 11 subspecies of Canada geese, which differed primarily in body size and color (Bellrose 1980). Today, there are generally two recognized distinct species of geese. Those two distinct species are the smaller cackling goose and the larger Canada goose (Mowbray et al. 2002, Willcox and Giuliano 2012). There are generally four recognized subspecies of cackling geese, which are generally found breeding and migrating within western and northwestern North America. Seven generally recognized subspecies of the Canada goose migrate into northern and eastern North America from their breeding grounds (Willcox and Giuliano 2012). In the Atlantic Flyway and Maine, only subspecies of the Canada goose can be found.

In the Atlantic Flyway, migratory Canada geese consist primarily of three distinct populations. Those populations include the North Atlantic Population (NAP), Atlantic Population (AP), and the Southern James Bay Population (SJBP) (USFWS 2012). The wintering migratory population in Maine is mostly comprised of geese from the NAP and the AP. In 2012, the number of breeding pairs of geese for the AP was estimated to be 190,300 pairs, which was similar to the 2011 estimate (USFWS 2012). The total spring population of AP geese was estimated at 871,200 geese (USFWS 2012). In 2012, there were an estimated 71,600 indicated pairs (singles plus pairs) of geese in the NAP, 48% more than the 2011 estimate. Indicated pair estimates have remained relatively stable since 2003 (USFWS 2012). The total NAP goose population was estimated at 229,000 geese in 2012, which was 50% higher than the 2011 estimate (USFWS 2012). The number of breeding geese in the SJBP was estimated to be 77,500 geese during the spring 2012 survey, which was similar to the 2011 estimate. The number of geese in the SJBP observed annually has shown a stable trend since 2003 (USFWS 2012). The number of Canada geese observed in the State during the CBC has shown an increasing trend since 1966 (NAS 2010).

As discussed previously, the NAP, the AP, and the SJBP of Canada geese could be found in the State under those conditions where geese present would be considered migratory. Under field conditions, distinguishing geese between population segments can be difficult. Determining whether a Canada goose present in the State is migratory or a resident can also be difficult under field conditions. Therefore, for the purposes of this analyses, those Canada geese present in the State from September through March will be considered as migratory geese.

Frameworks have been established by the USFWS and implemented by the MDIFW to allow for the harvest of geese in Maine during those months when geese that are present in the State could be migratory. The September season is intended to manage populations of resident geese but migratory geese could be present in the State. An estimated 1,700 geese were harvested in the State during the September season held during 2011 (Raftovich et al. 2012).

Two geese were taken by WS during those months when geese present in the State could be considered migratory. The actual number of migratory geese taken by WS is unknown. As stated previously, many of the geese taken by WS were likely resident geese (*i.e*., present in the State all year). The majority of management that may result in take of migratory Canada geese in Maine relates to the protection of human health and safety at public drinking water sources and airports. Canada goose management at those facilities would be conducted throughout the year, whenever the threat arises, and although non-lethal means would be the primary methods used to reduce threats from Canada geese, lethal methods could sometimes be employ as part of an integrated approach.

As additional efforts to manage damage associated with geese occur by the WS program in Maine, the lethal take of migrant Canada geese may also increase, but minimal lethal control combined with extensive non-lethal measures should minimize the lethal take of migrant geese. Additionally, although it is possible that geese taken between September and March would be migratory Canada geese, it is more likely that those birds would be resident individuals. Based on the possibility of WS conducting additional efforts, WS may take up to 100 geese during those periods when geese could be considered migratory in the State.

All lethal removal by WS would occur through the issuance of a depredation permit issued by the USFWS. All take of geese during the hunting seasons occur under frameworks established by the USFWS. Take by other entities in Maine occurs under depredation permits or depredation orders established by the USFWS with the requirement that take be reported to the USFWS. The number of geese taken under depredation permits that could be migratory geese or are taken during those months when migratory birds could be present in the State is unknown.

Cumulative impacts of the proposed action on migratory Canada geese would be based upon anticipated WS' take, hunter harvest, and authorized take by other (non-WS) entities. The number of migratory geese potentially taken by WS in Maine would likely be relatively low annually and would likely be related to activities conducted by WS to alleviate threats to drinking water supplies and threats of aircraft strikes. The majority of WS' lethal Canada goose damage management activities conducted previously have taken place during the months when migratory geese were not present in Maine (*i.e*., from April through August). Most, if not all of WS' Canada goose damage management activities, would be targeted towards the resident Canada goose population.

As shown in Table 4.5, 23,600 geese have been harvested from 2007 through 2011 during the regular waterfowl season in the State when those geese present in the State could be considered migratory. WS killed two geese that could be migratory, which would represent 0.01% of the total geese taken during the regular waterfowl season in the State from 2007 through 2011.

Under the proposed action, WS could lethally take up to 100 Canada geese during the months when migrant geese may be present in the State, based on previous requests for assistance and in anticipation of additional efforts to manage damage, primarily at public drinking water sources and airports. If the number of geese taken in the State during the regular waterfowl season were reflective of geese taken annually, the average number of geese taken in the State during those seasons would be 4,720 geese. WS' take of up to 100 geese would represent 2.1% of the geese taken annually.

During the CBC conducted in 2011, observers counted 6,908 geese in the State (NAS 2010). CBC data compiled since the 2002 survey conducted in the State, indicates an average of 4,127 geese have been observed during the CBC conducted annually. If WS had lethally taken 100 migratory Canada geese, the take would have represented 2.4% of the average number of geese observed annually in the State during the CBC conducted since 2002. Between the surveys conducted during the CBC from 2002 through 2011, the fewest number of geese counted was 2,557 geese observed in 2002 while the highest number recorded was 6,908 geese in 2011. If WS had lethally taken 100 migratory geese annually from 2002 through 2011, the take would have ranged from 1.5% to 3.9% of the geese observed during those years.

Data from the CBC 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 was presented in this analysis and compared to WS' proposed take to evaluate the magnitude of take proposed by WS when compared to the number of geese observed in the State during the CBC. The number of geese observed in areas surveyed during the CBC 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. Therefore, WS' proposed take of up to 100 migratory geese could be considered of low magnitude when compared with the number of geese that are harvested annually in the State. No take of migratory geese would occur by WS without a depredation permit issued by the USFWS. Therefore, WS' take would only occur at the discretion of the USFWS after population objectives for geese were considered.

Domestic and Feral Waterfowl Biology and Population Impact Analysis

Domestic waterfowl refers to captive-reared, domestic, of some domestic genetic stock, or domesticated breeds of ducks, geese, and swans. Examples of domestic waterfowl include, but are not limited to, mute swans, Muscovy ducks, Pekin ducks, Rouen ducks, Cayuga ducks, Swedish ducks, Chinese geese, Toulouse geese, Khaki Campbell ducks, Embden geese, and pilgrim geese. Feral ducks may include a combination of mallards, Muscovy duck, and mallard-Muscovy hybrids. All domestic ducks, except for Muscovy ducks, were derived from the mallard (Drilling et al. 2002).

Many waterfowl of domestic or semi-wild genetic backgrounds have been released by humans into rural and urban environments; including numerous species of ducks, geese, and swans. Selective breeding has resulted in the development of numerous domestic varieties of the mallard duck that no longer exhibit the external characteristics or coloration of their wild mallard ancestors. An example of a feral duck is the "*urban*" mallard duck. The coloration of the feathers of urban ducks is highly variable and often does not resemble that of the wild mallard duck. Urban mallard ducks often display the following physical characteristics: males may be missing the white neck ring or the neck ring will be an inch wide instead of the narrow 1/4 inch wide ring found on wild mallards; males may have purple heads instead of green heads and heavily mottled breast feathers; females may be blond instead of mottled brown; the bills of females may be small and black instead of orange mottled with black; either sex may have white coloration on the wings, tail, or body feathers; and urban ducks may weigh more than wild ducks (2.5 to 3.5 pounds).

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

Examples of areas where domestic waterfowl have been released are business parks, universities, wildlife management areas, parks, military bases, residential communities, and housing developments.

Federal law does not protect domestic varieties of waterfowl (see 50 CFR 21), nor are domestic waterfowl specifically protected by law in Maine. Domestic and feral waterfowl may be of mixed heritage and may show feather coloration of wild waterfowl. Some domestic and feral ducks are incapable of sustained flight, while some are incapable of flight at all due to hybridization. Domestic waterfowl may at times crossbreed with migratory waterfowl species creating a hybrid cross breed (*e.g.*, mallard X domestic duck, Canada goose X domestic goose). Those types of hybrid waterfowl species would be taken in accordance with definitions and regulations provided in 50 CFR 10 and 50 CFR 21.

Domestic ducks, geese, and swans are non-indigenous species considered by many wildlife biologists and ornithologists to be an undesirable component of North American wild and native ecosystems. Any reduction in the number of those domestic waterfowl species could be considered as providing a benefit to other native bird species since they compete with native wildlife for resources. Domestic and feral waterfowl are usually found near water, such as ponds, lakes, retaining pools, and waterways. Domestic and feral waterfowl generally reside in the same area year around with little to no migration occurring. Those domestic birds are often found in areas where resident Canada geese inhabit. Currently, there are no population estimates for domestic and feral waterfowl in Maine. Domestic and feral waterfowl are not protected by federal or State laws, and are not considered for population goal requirements, including the MBTA except for certain portions of the Muscovy duck population.

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

In anticipation of receiving requests for assistance by WS, take of up to 100 feral ducks and up to 100 feral geese could occur annually under the proposed action. Since feral waterfowl often compete with native wildlife species for resources, any take of feral waterfowl could be viewed as providing some benefit to the natural environment. The number of feral waterfowl inhabiting Maine is currently unknown. However, based on the limited take proposed and the likely benefit to the natural environment that could occur, take of up to 100 feral ducks and up to 100 feral geese would not adversely affect populations of those feral species.

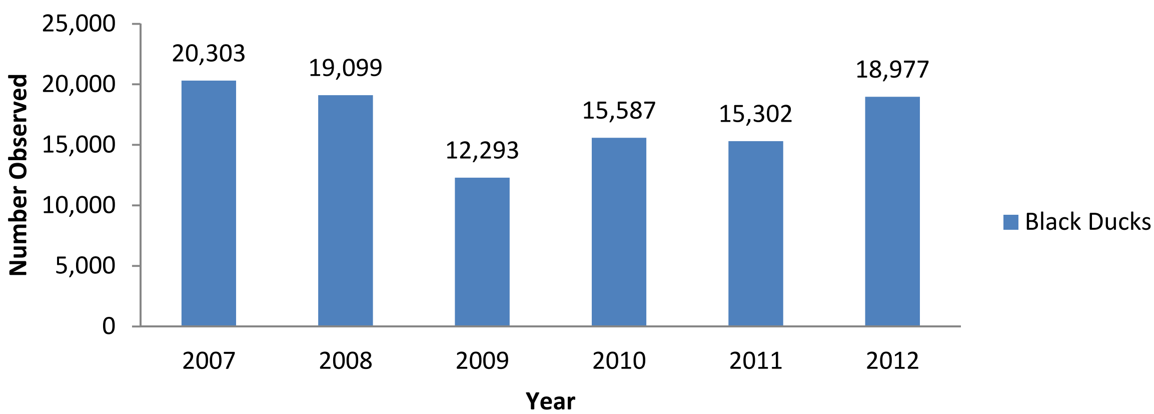
American Black Duck Biology and Population Impact Analysis

The American black duck is a large dabbling duck found primarily in the eastern United States and Eastern Canada (Longcore et al. 2000). Breeding populations occur in eastern Canada southward into the northeastern United States and the Great Lakes region (Longcore et al. 2000). Black ducks can be found wintering from the east-central United States south of the Great Lakes into the southeastern United States (Longcore et al. 2000). Black ducks can be found in a variety of wetland types including freshwater wetlands, lakes, ponds, streams, and bogs found in mixed hardwood and boreal forests, and salt marshes. The fall migration begins from September to early October as birds begin congregating near breeding areas. Breeding begins in February in the southern portion of their breeding range and may not begin until late-May in the northern portions of the range (Longcore et al. 2000). Migrating black ducks feed on seeds, foliage, aquatic tubers, invertebrates, agricultural grains, and they are known to feed on fish and amphibians (Longcore et al. 2000).

The American black duck is considered a summer resident in Maine nesting statewide where suitable habitat exists and considered a year around resident along the coastal areas of Maine (Longcore et al. 2000). Although breeding populations occur within the State, no population estimate is currently available. Since 1966, the number of black ducks observed in Maine during the BBS has increased at an estimated rate of 0.2% annually, with a 0.7% annual increase occurring from 2001 through 2011 (Sauer et al. 2012). Across all BBS routes surveyed in the United States, the number of American black ducks observed has shown annually declines since 1966 estimated at -3.4%, with a -0.5% annual decline occurring from 2001 through 2011 (Sauer et al. 2012). Across all survey routes surveyed during the BBS, the number of black ducks has shown an annual declining trend estimated at -0.5% since 1966; however, from 2001 through 2011, the number of blacks ducks observed has increased annually estimated at 1.2% (Sauer et al. 2012).

Black ducks are also present in the State during the annual migration periods with wintering populations found along the coastal areas of the State. The number of black ducks observed in areas surveyed during the CBC shows an overall decline since 1966 but the number observed since the early 1980s has remained relatively stable (NAS 2010). The average number of black ducks observed in areas surveyed during the CBC between the 2002 survey and the 2011 survey has been 8,732 black ducks. The lowest number observed occurred in 2008 when 6,852 black ducks were observed in areas surveyed during the CBC. The highest number observed occurred in 2007 when 11,026 ducks were observed during the CBC. Figure 4.1 shows the number of black ducks observed in Maine from 2007 through 2012 during the Midwinter Waterfowl Survey conducted along the Atlantic Flyway in 2012 by the USFWS. During the Survey conducted in 2012, 18,977 black ducks were observed in Maine (Klimstra and Padding 2012).

Figure 4.1 - Number of black ducks observed in Maine during the Mid-Winter Waterfowl Survey, 2007 -2012 (Raftovich et al. 2012).



Like most waterfowl species, black ducks can be harvested during regulated hunting seasons in Maine. Between 2007 and 2011, 20,540 black ducks have been harvested in the State. During the 2010 hunting season, an estimated 3,377 black ducks were harvested in the State, which compares to 2,133 black ducks harvested during the 2011 season in the State (Raftovich et al. 2012).

Table 4.6 – Cumulative Take of American black ducks in Maine, 2007-2011

Year	USFWS Authorized Take[1]	Take under Depredation Permits[1]		Hunter Harvest	Total Take
		WS' Take[2]	Total [1,3]		
2007	5	0	0	4,983	4,983
2008	20	0	0	4,683	4,683
2009	20	0	0	5,364	5,364
2010	20	0	2	3,377	3,379
2011	20	0	0	2,133	2,133
TOTAL	**85**	**0**	**2**	**20,540**	**20,542**

[1]Depredation take is reported by calendar year

[2]WS' take is reported by federal fiscal year

[3]Total reported take by all entities issued depredation permits

Except for 2007, the USFWS authorized the annual take of 20 black ducks in Maine by all entities between 2007 and 2011. The only reported take occurred in 2010 when two ducks were lethally removed to alleviate damage pursuant to depredation permits. From FY 2007 through FY 2011, WS did not receive requests for assistance in Maine associated with black ducks. However, like other waterfowl species, black ducks can be present in the State in large flocks during the migration periods. When those large flock occur at or near airports within the State, the risk of aircraft striking black ducks increases. If requested to assist with managing damage or threats of damage associated with black ducks, WS anticipates that up 50 ducks could be lethally removed annually to alleviate damage or the threat of damage.

Take of up to 50 black ducks would represent 0.6% of the average number of black ducks observed per year in areas surveyed during the CBC from 2002 through 2011. When compared to the lowest number of black ducks observed during the CBC from 2002 through 2011, the lethal removal of 50 black ducks would represent 0.7% of the number of ducks in areas surveyed within the State. 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 was used in this analysis and compared to WS' proposed take to evaluate the magnitude of take that could occur by WS when compared to the number of ducks observed in the State during the CBC. The number of black ducks observed in areas surveyed within the State during the CBC would be considered a minimum population estimate given the survey parameters of the CBC and the survey only covering a small portion of the State.

Take of 50 black ducks would represent 0.3% of the 18,977 black ducks observed in Maine during the Midwinter Waterfowl Survey conducted in 2012 along the Atlantic Flyway. Similarly, the take of 50 black ducks by WS would represent 0.3% of the 16,927 black ducks observed on average per year in Maine during the Midwinter Waterfowl Survey conducted along the Atlantic Flyway between 2007 and 2012.

As shown in Table 4.6, the USFWS has authorized the lethal removal of 20 black ducks per year from 2008 through 2011 in Maine to alleviate damage or risks of damage. If the USFWS continued to authorize the lethal take of up to 20 black ducks per year, the combined take of WS and other entities could total 70 black ducks. When combined with the highest level of take authorized by the USFWS in Maine, take under depredation permits would represent 0.4% of the number of black ducks estimated in the State during the 2012 Midwinter Waterfowl Survey and 0.4% of the average number of black ducks observed on the Survey from 2007 through 2012. Take of 70 black ducks by all entities would represent 0.8% of the average number of black ducks observed in areas surveyed during the CBC from 2002 through 2011 and 1.0% of the lowest number of black ducks observed during the CBC from 2002 through 2011.

Mallard Biology and Population Impact Analysis

Mallards are one of the most recognizable waterfowl species with a wide range across most of North America (Drilling et al. 2002). Mallards are considered the most abundant waterfowl species with the widest breeding range (Drilling et al. 2002). Mallards can be found wintering as far north as weather conditions allow. In Maine, breeding population can be found in appropriate habitat statewide with wintering populations found along the coastal areas of the State (Drilling et al. 2002). Breeding habitat varies as nesting occurs in primarily upland habitats with dense vegetation near water; however, nesting also occurs in agricultural fields, low woody cover, fallen logs, stands of dense saplings, dead treetops, hollow bases of trees, abandoned raptor or crow nests, and other dense herbaceous growth (Drilling et al. 2002).

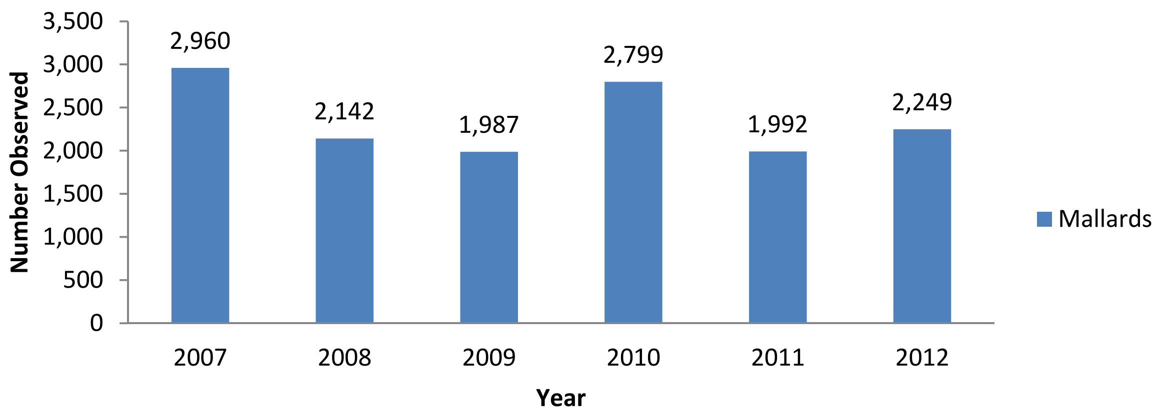
Like other waterfowl species, mallards often form large flocks during the migration periods. Densities often increase as mallards move between wintering and breeding areas during the migration periods. The large flocks can pose increased risks when those flocks occur on airport property or in the surrounding area. Large flocks near airfields increased the likelihood of aircraft striking multiple birds, which increases damage and increases the potential for catastrophic failure of the aircraft to occur. Large flocks of mallards can also cause damage to agricultural resources, primarily by trampling and consuming sprouting crops in the spring. The fall migration period begins in early August and continues through early-December with the peak occurring from early September through the end of November. The spring migration begins in early February and continues through early April with the peak occurring from mid-February through the end of May (Drilling et al. 2002).

The number of mallards observed in the State during the BBS has increased an estimated rate of 7.8% annually since 1966, which is statistically significant (Sauer et al. 2012). In the Atlantic Northern Forest region (BCR 14), a similar upward trend has been observed with the number of mallards observed during the BBS increasing at an 8.2% annual rate since 1966, with a 10.3% annual increase occurring from 2001 through 2011 (Sauer et al 2012). Mallards can be observed breeding throughout the State of Maine (Drilling et al. 2002). However, no breeding population estimates are available for mallards in the State.

Mallards are also present in the State during the annual migration periods with wintering populations found along the coastal areas of the State. The number of mallards observed in areas surveyed during the CBC shows an overall increase since 1966 (NAS 2010). The average number of mallards observed in areas surveyed during the CBC between the 2002 survey and the 2011 survey has been 7,477 mallards. The lowest number observed occurred in 2005 when 6,285 mallards were observed in areas surveyed during the CBC. The highest number observed occurred in 2010 when 10,302 mallards were observed during the CBC. As shown in Figure 4.2, a total of 2,249 mallards were observed in the State of Maine during the Midwinter Waterfowl Survey conducted in 2012, which compared to 1,992 mallards observed during the survey in 2011 (Klimstra and Padding 2012). Between 2007 and 2012, 2,355 mallards have been observed in the State per year on average during the Midwinter Waterfowl Survey.

Like many other waterfowl populations, mallards can be harvested in the State during regulated hunting seasons. During the 2010 hunting season, an estimated 8,379 mallards were harvested in Maine while an estimated 7,441 mallards were harvested in the State during the 2011 hunting season (Raftovich et al. 2012). Between 2007 and 2011, 52,529 mallards have been harvested in the State during the annual hunting season, which is an average of 10,506 mallards harvested annually in the State (see Table 4.7).

Figure 4.2 - Number of mallards observed in Maine during the Mid-Winter Waterfowl Survey, 2007 -2012 (Raftovich et al. 2012).



In addition to the take of mallards during the hunting season, 13 mallards have been lethally taken by WS from FY 2007 through FY 2011. Between 2007 and 2011, 61 mallards have been lethally removed by all entities issued depredation permits in the Maine. From FY 2007 through FY 2011, WS has translocated, freed, and dispersed 1,790 mallards to reduce damage to property, aircraft, and protect human safety in the State. From 2007 through 2011, the take of mallards under depredation permits represented 0.1% of the total number of mallards taken in the State by hunters.

Table 4.7 - Cumulative Take of Mallards in Maine, 2007-2011

Year	USFWS Authorized Take[1]	Take under Depredation Permits[1]		Hunter Harvest	Total Take
		WS' Take[2]	Total [1,3]		
2007	65	0	8	12,733	**12,741**
2008	160	0	15	11,265	**11,280**
2009	130	6	8	12,711	**12,719**
2010	180	0	27	8,379	**8,406**
2011	150	7	3	7,441	**7,444**
TOTAL	**685**	**13**	**61**	**52,529**	**52,590**

[1]Depredation take is reported by calendar year
[2]WS' take is reported by federal fiscal year
[3]Total reported take by all entities issued depredation permits

Based on the number of requests received for assistance previously and in anticipation of additional efforts to address damage or threats of damage, an annual take of up to 300 mallards could occur under the proposed action alternative by WS. WS anticipates the number of airports requesting assistance with managing threats associated with mallards on or near airport property will increase. Since 2007, the average number of mallards harvested in the State has been 10,506 mallards. Based on the average harvest of mallards from 2007 through 2011 during the hunting season, take of up to 300 mallards by WS would have represented 2.9% of the estimated average harvest.

Take of up to 300 mallards would represent 4.0% of the average number of mallards observed per year in areas surveyed during the CBC from 2002 through 2011. When compared to the lowest number of mallards observed during the CBC from 2002 through 2011, the lethal removal of 300 mallards would have represented 4.8% of the number of mallards observed in areas surveyed within the State. 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 was used in this analysis and compared to WS' proposed take to evaluate the magnitude of take that could occur by WS when compared to the number of mallards observed in the State during the CBC. The number of mallards observed in areas surveyed within the State during the CBC would be considered a minimum population estimate given the survey parameters of the CBC and the survey only covering a small portion of the State.

Take of 300 mallards would represent 13.3% of the 2,249 mallards observed in Maine during the Midwinter Waterfowl Survey conducted in 2012 along the Atlantic Flyway. Similarly, the take of 300 mallards by WS would represent 12.7% of the 2,355 mallards observed on average per year in Maine during the Midwinter Waterfowl Survey conducted along the Atlantic Flyway between 2007 and 2012.

As shown in Table 4.7, the USFWS authorized the lethal removal of up to 180 mallards during 2010 in Maine to alleviate damage or risks of damage. If the USFWS continued to authorize the lethal take of up to 180 mallards per year, the combined take of WS and other entities could total 480 mallards. When combined with the highest level of take authorized by the USFWS in Maine, take under depredation permits would represent 21.3% of the number of mallards estimated in the State during the 2012 Midwinter Waterfowl Survey and 20.4% of the average number of mallards observed on the Survey from 2007 through 2012. Take of 480 mallards by all entities would represent 6.4% of the average number of mallards observed in areas surveyed during the CBC from 2002 through 2011 and 7.6% of the lowest number of mallards observed during the CBC from 2002 through 2011.

Based on the known take of mallards in the State, take of up to 300 mallards annually by WS to alleviate damage would not adversely affect mallard populations in Maine. All take by WS would occur under a depredation permit issued by the USFWS, which ensures the cumulative take of mallards from all known sources is considered when establishing population objectives for mallards.

Hooded Merganser Biology and Population Impact Analysis

The hooded merganser has a breeding range that encompasses a wide area in the forested eastern and northwestern United States where suitable nesting cavities are available. Band recovery data has shown that most hooded mergansers over winter in coastal Atlantic states and the Mississippi flyway. Some hooded mergansers winter as far north as ice allows. Preferred winter habitats include forested freshwater wetlands, brackish estuaries, and tidal creeks. Hooded mergansers feed on small fish, aquatic insects, and crayfish. Nesting occurs in April, usually in tree cavities near water (Dugger et al. 2009).

Similar to the other species of mergansers addressed in this assessment, WS has previously received requests to address hooded mergansers to reduce the prevalence of swimmer's itch in lakes. WS has previously addressed all species of mergansers using non-lethal dispersal methods; however, WS could be requested to lethally remove mergansers if non-lethal dispersal methods were ineffective at dispersing mergansers. In anticipation of lethal take being requested, WS estimates that up to 30 hooded mergansers could be lethally taken annually by WS under the proposed action. In addition, up to 20 nests could be destroyed as part of non-lethal efforts to disperse mergansers from areas.

Hooded mergansers can be found breeding across Maine where suitable habitat exists (Dugger et al. 2009). In winter, hooded mergansers can be found in the southern portion of the State (Dugger et al. 2009), but is dependent on the availability of open water. Breeding populations appear to be increasing in the State based on BBS data. From 1966 through 2011, the number of hooded mergansers observed along routes surveyed during the BBS has shown an increasing trend estimated at 10.6% annually (Sauer et al. 2012). Between 2001 and 2011, the number of hooded mergansers observed during the BBS has shown an 11.1% annually increase in the State (Sauer et al. 2012). In the Atlantic Northern Forest region (BCR 14), the number of hooded mergansers observed during the BBS has also shown increasing trends between 1966 and 2011 estimated at 5.0% annually, with a 8.5% annual increase occurring from 2001 to 2011 (Sauer et al. 2012). The number of hooded mergansers observed in areas surveyed during the CBC showed a decline from 1966 through the mid-1980s but has shown a general increasing trend between the late 1980s and 2011 (NAS 2010).

Hooded mergansers can also be harvested in the State during annual hunting seasons. Between 2007 and 2011, 8,200 hood mergansers have been harvested in the State (Klimstra and Padding 2012). The harvest of hooded mergansers from 2007 through 2011 has ranged from a low of 900 mergansers that were harvested in 2010 to a high of 2,500 hooded mergansers harvested during 2009 (Klimstra and Padding 2012). Between 2007 and 2011, 1,640 hooded mergansers have been harvested on average in the State during the annual hunting season. With a statewide harvest average of 1,640 hooded mergansers, take of up to 30 hooded mergansers by WS would represent 1.8% of the average annual harvest, if harvest levels remain relatively stable. With the annual harvest in the State ranging from 900 to 2,500 mergansers from 2007 through 2011, if 30 mergansers had been lethally removed by WS each year, the take would represent 1.2% to 3.3% of the harvest in the State. Take of mergansers by other entities to alleviate damage or threats of damage has not occurred previously.

Like other bird species, the limited destruction of nests to disperse birds from areas would not reach a magnitude where adverse effects would occur to the population of hooded mergansers. Take by WS would only occur after a depredation permit had been issued by the USFWS and the MDIFW for the take of mergansers. The issuance of a depredation permit by the USFWS and the MDIFW ensures the cumulative take of mergansers from all known sources would be considered when establishing population objectives for mergansers.

Common Merganser Biology and Population Impact Analysis

The common merganser is a fish-eating duck that nests in forested habitats in aquatic environments of the northern portion of North America and elsewhere around the world. Mergansers feed primarily on salmon (*Salmo* spp. and *Oncorhynchus* spp.), trout (*Salvelinus* spp.), suckers (*Catostomus* spp.), sculpin (*Cottus* spp.), shad (*Dorosoma* spp.), sticklebacks (*Gasterosteus* spp. and *Pungitius* spp.), chub (*Semotilus* spp. and *Couesius* spp.), minnows (*Notropis* spp. and *Notemigonus* spp.), insects, mollusks, crustaceans, worms, frogs, small mammals, birds, and plants. Common mergansers overwinter on lakes, rivers, and reservoirs of the central United States and along the coasts. Mergansers usually nests in tree cavities but will also nest on the ground or in crevices. Females breed in their second year, and lay one clutch per year (Mallory and Metz 1999).

In Maine, mergansers have been known to be an intermediate host in the lifecycle of a free-swimming aquatic trematode parasite (schistosome) that utilizes certain species of birds and aquatic snails as hosts to complete its life cycle (CDC 2012). The parasite is known to cause cercarial dermatitis, or swimmer's itch, which is a skin reaction caused by the parasite burrowing into the skin of people that swim in freshwater habitats and marine coastal environments. WS has previously been requested to assist with managing the presence of common mergansers, red-breasted mergansers, and hooded mergansers on lakes and ponds where those mergansers have been associated with swimmer's itch. WS has dispersed 2,140 common mergansers between FY 2007 and FY 2011 to reduce threats to human health and safety in Maine. Through live trapping efforts, WS has trapped and translocated 10 common mergansers in efforts to reduce the incidence of swimmer's itch in Maine waters.

Previous requests for assistance associated with mergansers were addressed by WS using non-lethal dispersal methods. However, WS could be requested to employ lethal methods to remove mergansers if birds become habituated to the use of non-lethal methods. Based on the number of mergansers addressed previously and in anticipation of additional efforts to address mergansers, WS could lethally remove up to 30 common mergansers annually within the State. In addition, up to 20 nests could be destroyed by WS annually to alleviate damage or threats of damage. Take would only occur when permitted by the USFWS and only at levels permitted.

In Maine, the number of common mergansers observed along BBS routes has shown a declining trend since 1966 estimated at -0.4% annually; however, between 2000 and 2010, the number of mergansers observed along routes in the State has shown a declining trend estimated at -4.7% annually (Sauer et al. 2012). In the Atlantic Northern Forest region (BCR 14), the number of common mergansers observed along BBS routes has shown an increasing trend estimated at 2.2% annually between 1966 and 2010, with a 3.2% increasing trend observed from 2001 through 2011, which is statistically significant (Sauer et al. 2012). The number of common mergansers observed in the State during the CBC has shown a cyclical pattern but an overall declining trend since 1966 (NAS 2010). During the Atlantic Flyway Breeding Waterfowl Plot Survey conducted in 2012 from Vermont to Virginia, the population of common mergansers in those areas was estimated at 50,128 mergansers (Klimstra and Padding 2012). The number of mergansers present in Maine during the breeding season is unavailable. Overall, the number of common mergansers present in the State likely fluctuates, especially during the migration periods as birds move through the State to wintering and breeding grounds.

Like other waterfowl, mergansers can be harvested in the State during annual hunting seasons. Between 2007 and 2011, the number of common mergansers estimated to have been harvested in the State annually has ranged from 100 to 900 mergansers, with an average of 400 mergansers harvested annually (Klimstra and Padding 2012). If the take of mergansers by WS reached 30 individuals and the number of mergansers harvested in the State during the annual hunting season remains relatively stable, WS' take would range from 3.3% to 30.0% of the harvest levels that occurred from 2007 through 2011. When compared to the average harvest of mergansers estimated at 400 mergansers, take of up to 30 mergansers by WS would represent 7.5% of the average annual harvest. The USFWS has not issued depredation permits for the take of common mergansers to other entities within the State.

Like other bird species, the limited destruction of merganser nests to disperse birds from areas would not reach a magnitude where adverse effects would occur to the population of common mergansers. All take by WS would occur under a depredation permit issued by the USFWS and the MDIFW for the take of those mergansers. Therefore, the issuance of a depredation permit by the USFWS and the MDIFW would ensure the cumulative take of mergansers from all known sources was considered when establishing population objectives for mergansers.

Red-breasted Merganser Biology and Population Impact Analysis

The red-breasted merganser nests in northern Minnesota, Wisconsin, Michigan, Maine, and much of Canada and migrates south in the fall to temperate waters on both coasts. The red-breasted merganser typically nests on the ground, has dark-colored down, and uses salt-water environments more than the common merganser. Nest site locations occur under shelter or in dense cover such as under lower branches of drooping conifers, under fallen logs, between and under boulders, in shallow cavities, and at the base of stumps. Nesting usually occurs from May into June. Mergansers begin to breed during their second year of age, with an average clutch size of 5 to 24 eggs. Red-breasted mergansers feed on an array of small fish, crustaceans, worms, insects, and amphibians (Titman 1999).

Similar to common mergansers, WS has previously received requests to address red-breasted mergansers that are loafing, roosting, and nesting on or near lakes where swimmer's itch is prevalent. WS has previously addressed mergansers using non-lethal dispersal methods; however, WS could be requested to lethally remove mergansers from bodies of water where swimmer's itch is prevalent if non-lethal dispersal methods were ineffective. In anticipation of lethal take being requested, WS estimates that up to 30 red-breasted mergansers could be lethally taken annually by WS under the proposed action. In addition, up to 20 nests could be destroyed as part of non-lethal efforts to disperse mergansers from areas.

Although red-breasted mergansers are known to breed in Maine, no data from the BBS for red-breasted mergansers is available (Sauer et al. 2012). In the Atlantic Northern Forest region (BCR 14), the number of red-breasted mergansers observed during the BBS has shown a declining trend since 1966 estimated at -0.5%, with a 1.6% annual increase estimated from 2001 through 2011 (Sauer et al. 2012). Across all routes surveyed during the BBS, including routes in Canada, the number of red-breasted mergansers have shown a declining trend from 1966 through 2011 estimated at -7.4% annually; however, between 2001 and 2011, the number observed across all survey routes has shown an increasing trend estimated at 0.9% annually (Sauer et al. 2012). The number of red-breasted mergansers observed in areas surveyed during the CBC has shown a cyclical pattern since 1966 but a general overall increasing trend in the State (NAS 2010). Like other waterfowl species, the number of red-breasted mergansers present in the State likely fluctuates, especially during the migration periods as birds move between breeding areas and wintering areas.

Like common mergansers, red-breasted mergansers can be harvested in the State during annual hunting seasons. Between 2007 and 2011, 2,500 red-breasted mergansers have been harvested in the State. The lowest harvest level between 2007 and 2011 occurred in 2010 and 2011 when 100 mergansers were harvested, respectively. The highest harvest level between 2007 and 2011 occurred in 2008 when 900 mergansers were harvested (Klimstra and Padding 2012). The average annual harvest of mergansers between 2007 and 2011 was 500 mergansers.

With a statewide harvest average of nearly 500 red-breasted mergansers, take of up to 30 red-breasted mergansers by WS would represent 6.0% of the average annual harvest, if harvest levels remained relatively stable. With the annual harvest in the State ranging from 100 to 900 mergansers from 2007 through 2011, if 30 mergansers had been lethally removed by WS each year, the take would represent 3.3% to 30.0% of the harvest in the State. The take of mergansers by other entities to alleviate damage or threats of damage has not occurred previously.

Like other bird species, the limited destruction of red-breasted merganser nests to disperse birds from areas would not reach a magnitude where adverse effects would occur to their population. Take by WS would only occur after a depredation permit had been issued by the USFWS and the MDIFW for the take of mergansers. The issuance of a depredation permit by the USFWS and the MDIFW ensures the cumulative take of mergansers from all known sources would be considered when establishing population objectives for mergansers.

Osprey Biology and Population Impact Analysis

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). A survey of nesting osprey in New Jersey found that 75% of nesting osprey use single-post platforms erected for nesting while 8% of osprey nests occurred on cell towers, 4% occurred on channel markers, 3% nested on duck blinds, 2% occurred on dead trees, and 7% nested on other structures (Clark and Wurst 2010). Osprey 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). For example, the average osprey nest 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).

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. When osprey nests are built on electrical structures, debris from the nest can contact high voltage transformers and wires causing electrical power failures.

In Maine, ospreys can be found nearly statewide during the breeding season in areas near aquatic habitats, such as along the coast and major river systems (Poole et al. 2002). Since 1966, the number of osprey observed along routes surveyed in the State during the BBS has shown an increasing trend estimated at 3.0% annually (Sauer et al. 2012). Between 2001 and 2011, the number of osprey observed in the State has shown an upward trend estimated at 3.5% annually (Sauer et al. 2012). Along routes surveyed in the eastern United States during the BBS, the number of osprey observed since 1966 has shown an increasing trend estimated at 3.4% annually, which is a statistically significant increasing trend (Sauer et al. 2012). From 2001 through 2011, the number of osprey observed during the BBS conducted in the eastern United States has continued to show an increasing trend estimated at 5.4% annually (Sauer et al. 2012). Across all routes surveyed in the United States during the BBS, the number of osprey counted has shown an increasing trend estimated at 2.9% annually since 1966 and 5.2% annually between 2001 and 2011, which are statistically significant upward trends (Sauer et al. 2012). Based on data from the BBS, Rich et al. (2004) estimated the statewide breeding population of osprey was 1,600 birds. Ospreys are infrequently observed in areas surveyed during the CBC (NAS 2010). The number of osprey found wintering in the State is likely related to the availability of open water for foraging on fish.

Previous requests for assistance received by WS to alleviate damage or the threat of damage associated with ospreys has involved threats to aircraft from strikes and have been associated with nests of osprey, primarily nests on structures used for the transmission of electrical power. Ospreys are also known to construct nests on property utilized for human activity, such as on boats. Osprey nesting near airports can also pose risks of aircraft strikes, which could cause damage to aircraft and threatening aviation safety.

WS has responded to previous requests for assistance involving osprey by using harassment methods to disperse osprey and by removing eggs in nests to discourage nesting in areas where damage or threats were occurring. Between FY 2006 and FY 2011, the WS program in Maine addressed six requests for assistance associated with osprey nests by removing eggs from those nests. Eggs removed were immediately transported to a state approved bird rehabilitation facility for incubation, hatching, and rearing of chicks. No lethal take of ospreys has occurred by WS in the State to alleviate damage or threat of damage between FY 2006 and FY 2011.

WS would 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. Eggs located in nests to be removed could be transported to a State-approved wildlife rehabilitator to be reared until they could be released into the wild or could be relocated to other osprey nests. Based on previous requests for assistance to manage damage associated with osprey and in anticipation of additional efforts to address damage, WS could remove up to 20 nests annually. The clutch size for ospreys ranges from one to four eggs (Poole et al. 2002). If each nest to be removed contained four eggs, up to 80 eggs could be relocated to other osprey nests, could be released to wildlife rehabilitators for rearing, and/or could be destroyed when other osprey nests or a State-approved rehabilitator could not be located. Eggs could be destroyed through addling or shaking. In addition, nestlings in osprey nests to be removed could be captured and provided to State-approved wildlife rehabilitators for rearing to be released back into the wild.

The relocation of up to 80 eggs or the release of up to 80 eggs to wildlife rehabilitators would not adversely affect populations of osprey in the State since those eggs would be incubated and hatched with the young reared and released into the wild once they are able to survive on their own. If a rehabilitator was unavailable or unwilling to care for the eggs, WS could be requested to destroy eggs. The destruction of bird eggs as part of damage management activities is generally considered a non-lethal method that does not adversely affect populations when the number of eggs destroyed is limited. If 80 osprey eggs were destroyed, those eggs would represent 5.0% of the current estimated statewide population of osprey. However, take of up to 80 eggs annually would be unlikely given the average number of eggs per osprey nest ranges from one to four. The take of 80 eggs was analyzed to present a worst-case scenario to determine the potential for population impacts.

Under the proposed action alternative, WS could be requested to use lethal methods to remove osprey when non-lethal methods were ineffective or were 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 were ineffective. Based on previous requests for assistance to manage damage associated with osprey and in anticipation of additional efforts to address damage, WS could lethally take up to 10 ospreys annually in the State. There was no lethal removal of osprey by other entities in Maine nor was the lethal removal of osprey authorized by the USFWS in Maine from 2006 to 2010. In 2011, the USFWS authorized entities within the State to lethally remove up to 10 ospreys and authorized the destruction of up to five active osprey nests with eggs.

Based on a statewide population estimated at 1,600 osprey and if up to 10 osprey were removed in any given year, WS' take would represent 0.6% of the estimated population if the population remained at least stable. If the USFWS continued to authorize the lethal take of up to 10 ospreys by other entities, the cumulative take could be 20 ospreys by all entities. The cumulative take of osprey would represent 1.3% of a statewide breeding population estimated at 1,600 ospreys. The take of osprey, including nest and eggs, by WS would only occur when permitted and only at levels authorized on depredation permits issued by the USFWS and the MDIFW.

Bald Eagle Biology and 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, except Rhode Island and Vermont (Buehler 2000). The bald eagle has been the national emblem of the United States since 1782 and has been a key symbol for Native Americans (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. Eggs are 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 1.6). 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 "*endangered*" status was extended to all populations of bald eagles in the lower 48 States, except populations of bald eagles in Minnesota, Wisconsin, Michigan, Washington, and Oregon were listed as "*threatened*" in 1978. As recovery goals for bald eagle populations began to be reached in 1995, all populations of eagles in the lower 48 States were reclassified as "*threatened*". In 1999, the recovery goals for populations of eagles had been reached or exceeded and the eagle was proposed for removal from the ESA. The bald eagle was officially de-listed from the ESA on June 28, 2007 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.

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 USC 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 in the State. 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 were issued by the USFWS to harass eagles that were posing a threat of aircraft strikes, no activities would be conducted by WS. Activities would only be conducted by WS when a permit allowing for the harassment of eagles had been issued to WS or to an airport authority where WS was working as a subpermittee under the permit issued to the airport. No lethal take of eagles would occur under this proposed action alternative.

WS would abide by all measures and stipulations provided by the USFWS in permits issued for the harassment of eagles at airports to reduce aircraft strikes. The USFWS determined that the issuance of permits allowing the "*take*" of eagles as defined by the Act would not significantly affect 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*).

Sharp-shinned Hawk Biology and Population Impact Analysis

Sharp-shinned hawks are found throughout the United States (Bildstein and Meyer 2000). In Maine, sharp-shinned hawks can be found breeding within the State with hawks found throughout the year along the coastal areas of the State (Bildstein and Meyer 2000). Sharp-shinned hawks are generally found in forested areas, but will use open areas with wooded vegetation interspersed or adjacent to old fields, pastures, or marshlands. The diet of the sharp-shinned hawk consists primarily of birds, but also includes a wide variety of small mammals and occasionally insects (Bildstein and Meyer 2000). The open habitat with abundant prey items makes airports attractive locations for sharp-shinned hawks. Most requests for assistance received by WS involving sharp-shinned hawks occur at airports.

In Maine, the number of sharp-shinned hawks observed in the State along routes surveyed during the BBS has shown an increasing trend estimated at 1.3% annually since 1966 (Sauer et al. 2012). From 2001 to 2011, the number of sharp-shinned hawks observed along BBS routes has increased 1.8% annually (Sauer et al. 2012). A similar trend has been observed for the number of sharp-shinned hawks observed in the Atlantic Northern Forest region. In the Atlantic Northern Forest region, the number of sharp-shinned hawks observed in areas surveyed during the BBS has shown an annual increase estimated at 1.6% since 1966, with a 2.5% annual increase occurring from 2001 through 2011 (Sauer et al. 2012). The number of sharp-shinned hawks observed in the State during the CBC has shown a cyclical pattern but a general stable trend since 1966 (NAS 2010). Using data from the BBS, Rich et al. (2004) estimated the statewide breeding population of sharp-shinned hawk to be 8,000 hawks.

WS has not previously been requested to provide assistance to alleviate damage or threats associated with sharp-shinned hawks in the State. However, WS could be requested to alleviate damage or threats associated with sharp-shinned hawks, primarily at airports where raptors can pose an aircraft strike threat. To alleviate damage, the WS program in Maine could employ lethal and non-lethal methods to address those threats when requested under the proposed action alternative.

As additional airports request assistance to alleviate threats posed by wildlife, WS anticipates that up to 20 sharp-shinned hawks could be captured and translocated. Sharp-shinned hawks could be live-captured using bal-chatri traps or Swedish Goshawk traps and translocated from areas where threats to human health and safety were occurring. All sharp-shinned hawks live-captured in traps would be translocated to an area not less than 50 miles away and released into appropriate habitat. In addition, sharp-shinned hawks captured and translocated would be banded for identification purposes using United States Geological Survey approved metal leg-bands appropriate for the species. Banding would occur pursuant to a banding permit issued by the United States Geological Survey. Fair et al. (2010) stated "[w]*hen appropriate* [leg] *band sizes are used, the occurrence and rate of adverse effects on the subjects is ordinarily very low*". As a condition of WS' depredation permit issued by the USFWS, any translocation of raptors would be coordinated and/or approved with the MDIFW.

However, if an immediate threat to human safety or property occurred or if raptors returned to areas after translocation occurred, those individuals could be lethally removed. For example, if a raptor was posing an immediate threat of an aircraft strike at an airport and could not be effective dispersed using non-lethal methods or had habituated to non-lethal methods, lethal removal could occur. Another example would be if a raptor or a pair of raptors was swooping at people in defense of a nest or eggs posing a risk to human safety, those raptors could be lethally removed.

Although the live-capture and translocating of sharp-shinned hawks would be a non-lethal method of reducing risks, sharp-shinned hawks could be translocated during their nesting season, which could lower nesting success. In New Brunswick, eggs were generally observed in nests of sharp-shinned hawks as early as mid-May (Meyer 1987). The young fledged by mid-July and became independent in August (Meyer 1987). The incubation of eggs and brooding of young is accomplished primarily by the female while the male provides much of the food during the incubation and early brooding stages (Delannoy and Cruz 1988).

The average clutch size for breeding pairs of sharp-shinned hawks is four to five eggs, with a range of three to eight eggs. If the live-capture and translocation of 20 sharp-shinned hawks resulted in 20 failed nests, the total number of fledglings produced in the State could be reduced by 160 sharp-shinned hawks if no other factors were considered. However, the annual reproductive success rate (*i.e.*, the percentage of nesting attempts that result in at least one fledgling) has been shown to be highly variable, between 29% and 92% (Meyer 1987). The rate of egg hatching has ranged from 63% to 87% with 47% to 95% of hatchlings reaching the fledgling stage (Meyer 1987).

Although reduced nesting success could occur by removing one of the adult pairs of sharp-shinned hawks during the nesting season, available information indicates the successful raising of young could occur if only one adult was left to tend to the young. The degree of success would likely be related to the sex of the adult removed, the developmental stage of the eggs or nestlings, availability of food sources, and the time of year the removal of one of the adult pairs occurred. In addition, re-nesting has been documented for sharp-shinned hawks after nest failures (Delannoy and Cruz 1988). If both adults were removed, the nest would not be successful.

As additional airports request assistance to alleviate threats posed by wildlife and as threats to human safety occur, WS anticipates that up to 20 sharp-shinned hawks could be lethally taken annually to address those requests for assistance. The statewide breeding population of sharp-shinned hawks has been estimated at 8,000 birds (Rich et al. 2004). Based on the best available population estimate, the cumulative take of sharp-shinned hawks would represent 0.3% of the estimated statewide breeding population. From 2007 through 2011, no sharp-shinned hawks were authorized by the USFWS to be lethally removed in Maine to alleviate damage or threats of damage.

The take of raptors can only occur when permitted by the USFWS pursuant to the MBTA through the issuance of depredation permits. Therefore, all take, including take by WS, must be authorized by the USFWS. In addition, lethal removal must be authorized by the MDIFW. Therefore, the lethal removal of hawks would occur at the discretion of the USFWS and the MDIFW. The take of sharp-shinned hawks by WS would only occur at levels authorized by the USFWS and the MDIFW. The permitting process ensures the cumulative lethal take would be considered as part of population management objectives for sharp-shinned hawks in the State.

Cooper's Hawk Biology and Population Impact Analysis

Cooper's hawks can be found throughout the United States (Curtis et al. 2006). In Maine, Cooper's hawks can be found nesting in the State (Curtis et al. 2006). Cooper's hawks are generally found in forested areas, but will use open areas with wooded vegetation interspersed or adjacent to old fields, pastures, or marshlands. Additionally, Cooper's hawks have been documented as being tolerant of human disturbance and fragmentation, and have been increasing in suburban and urban areas in recent years

(Curtis et al. 2006). The diet of the Cooper's hawk consists primarily of medium sized birds, but also includes a wide variety of small mammals and occasionally insects (Curtis et al. 2006). The open habitat with abundant prey items, such as European starlings and pigeons, makes airports and urban areas attractive locations for Cooper's hawks and where most requests for assistance to alleviate threats occur.

In Maine, the number of Cooper's hawks observed along routes surveyed during the BBS has shown an increasing trend estimated at 6.3% annually since 1966; however, an 11.2% annual increase has been observed between 2001 and 2011 (Sauer et al. 2012). A similar increasing trend has been observed for the number of Cooper's hawks observed in the Atlantic Northern Forest region which has been estimated to be increasing 3.7% annually since 1966, and 8.4% since 2001 (Sauer et al. 2012). The number of Cooper's hawks observed in the State during the CBC has shown an increasing trend since 1966, with observations showing a substantial increase beginning in the mid-1990s (NAS 2010). Using data from the BBS, Rich et al. (2004) estimated the statewide breeding population of Cooper's hawks to be 700 birds.

To alleviate damage threats, primarily at airports, the WS program in Maine has previously employed non-lethal methods to disperse Cooper's hawks. WS employed non-lethal methods to capture and translocate seven Cooper's hawks from FY 2006 through FY 2011 (see Table 4.8). Cooper's hawks were live-captured using bal-chatri traps or Swedish Goshawk traps and translocated from areas where threats to human health and safety were occurring. All Cooper's hawks live-captured in traps were translocated to an area not less than 50 miles away and released into appropriate habitat. In addition, Cooper's hawks captured and translocated were banded for identification purposes using United States Geological Survey approved metal leg-bands appropriate for the species. Lethal methods were not employed by WS to take Cooper's hawks between FY 2006 and FY 2011.

Table 4.8 – Number of Cooper's hawks addressed in Maine from 2007 to 2011

Year	Translocated by WS[1]	USFWS Authorized Take[2]	Take under Depredation Permits	
			WS' Take[1]	Total Take[2,3]
2007	0	0	0	0
2008	0	0	0	0
2009	1	6	0	1
2010	1	8	0	0
2011	5	0	0	0
TOTAL	**7**	**14**	**0**	**1**

[1]Data reported by federal fiscal year
[2]Data reported by calendar year
[3]Total take by all entities authorized under depredation permits issued by the USFWS

WS anticipates that up to 20 Cooper's hawks could be lethally taken annually and up to 20 Cooper's hawks could be captured and translocated to address those requests for assistance. WS anticipates continuing to address requests for assistance associated with Cooper's hawks with non-lethal dispersal and translocation. However, similar to sharp-shinned hawks, if an immediate threat to human safety or property occurs or if Cooper's hawks return to areas after translocation occurs, those individuals could be lethally removed. WS would continue to employ bal-chatri traps and Swedish Goshawks traps to live-capture Cooper's hawks. When translocation has been deemed appropriate using WS Decision model, those hawks would be banded using approved metal leg-bands appropriate for the species. Any translocation of raptors would be coordinated and/or approved with the MDIFW.

The USFWS authorized the lethal removal of six Cooper's hawks to alleviate damage in the State during 2009 and authorized the lethal removal of eight Cooper's hawks in 2010. However, only one Cooper's hawk was reported as lethally removed between 2007 and 2011. The best available information estimated the statewide breeding population of Cooper's hawks 700 birds (Rich et al. 2004). If up to 20 Cooper's hawks were lethally removed by WS per year, the removal would represent 2.9% of the estimated breeding population, if the population remains at least stable.

The USFWS authorized the lethal removal of up to eight Cooper's hawks in 2010. If eight hawks were removed by other entities, the combined take between WS and other entities would be 28 hawks. If 28 hawks were lethally removed by all entities, the removal would represent 4.0% of the estimated breeding population.

Although the live-capture and translocation of Cooper's hawks by WS would be a non-lethal method of reducing damage, Cooper's hawks could be translocated during their nesting season, which could lower nesting success. Eggs are generally observed in nests of Cooper's hawks beginning in late March through early June, with the peak occurring from April through May (Curtis et al. 2006). Nestlings are generally present in nests from late April through early July, with the peak occurring in May and June (Curtis et al. 2006). Incubation occurs primarily by the female hawk, with most daytime incubation occurring by the female and all nighttime incubation. The male may incubate eggs for 10 to 25 minutes two to three times each day as the female leaves the nest to feed on prey brought by the male (Curtis et al. 2006). Brooding and feeding of young occurs strictly by the female until the nestlings are 12 to 14 days old. The female will then begin to leave the nest to forage. After hatching, the male continues to deliver food to the female until she begins leaving to forage (Curtis et al. 2006).

The average clutch size for breeding pairs of Cooper's hawks is three to five eggs, with a range of one to seven eggs. If the live-capture and translocation of 20 Cooper's hawks resulted in 20 failed nests, the total number of fledglings produced in the State could be reduced by 140 Cooper's hawks if no other factors were considered. However, the annual reproductive success rate (*i.e.*, the percentage of nesting attempts that result in at least one fledgling) has been shown to be highly variable, but a 53% to 85% success rate is generally estimated for wild populations (Curtis et al. 2006). The rate of egg hatching success has ranged from 74% to 96% with an average of 2.7 to 3.5 fledglings per successful nest (Curtis et al. 2006).

Although reduced nesting success could occur by removing one of the adult pairs of Cooper's hawks during the nesting season, available information indicates the successful raising of young could occur if only one adult was left to tend to the young. The degree of success would likely be related to the sex of the adult removed, the developmental stage of the eggs or nestlings, availability of food sources, and the time of year the removal of one of the adult pairs occurred. In addition, re-nesting has been documented for Cooper's hawks after nest failures (Curtis et al. 2006). If both adults were removed, the nest would not be successful.

The take of Cooper's hawks can only occur when permitted by the USFWS pursuant to the MBTA through the issuance of depredation permits. Therefore, all take, including take by WS, must be authorized by the USFWS. In addition, lethal removal must be authorized by the MDIFW. Therefore, the lethal removal of hawks would occur at the discretion of the USFWS and the MDIFW. The take of Cooper's hawks by WS would only occur at levels authorized by the USFWS and the MDIFW. The permitting process ensures the cumulative lethal take would be considered as part of population management objectives for Cooper's hawks in the State.

Red-tailed Hawk Biology and Population Impact Analysis

The red-tailed hawk is one of the most widely distributed raptor species in North America with a breeding range extending from northern Canada and Alaska southward to northern and central Mexico (Preston and

Beane 2009). In the northern portion of their range, including most of Canada and Alaska, the red-tailed hawk is a common summer resident migrating southward during the fall and winter migration periods. In the conterminous United States, the red-tailed hawk is a year-round resident, including Maine (Preston and Beane 2009). Migration movements are primarily dependent on snow cover and the availability of prey items with most migratory movements being less than 1,500 kilometers (Preston and Beane 2009). Red-tailed hawks are capable of exploiting a broad range of habitats with the availability of structures for perching, nesting, and the availability of prey items being the key factors. Red-tailed hawks are most commonly found in open areas interspersed with patches of trees or other similar structures and are tolerant of some human activity with breeding populations occurring in large, urban environments (Preston and Beane 2009).

Populations of red-tailed hawks in North America showed increasing trends during the mid- to late-1900s. These increasing trends were likely in response to the conversion of forested areas to agricultural production, which provided more open habitat environments (Preston and Beane 2009). Between 1966 and 2011, the number of red-tailed hawks observed along routes surveyed during the BBS has shown an increasing trend estimated at 1.9% annually across all routes surveyed in the United States, which is a statistically significant trend (Sauer et al. 2012). Across all routes surveyed, the increase has been estimated at 1.7% annually, which is also a statistically significant trend (Sauer et al. 2012). In Maine, the number of red-tailed hawks observed during the BBS has also shown an increasing trend estimated at 5.1% annually between 1966 and 2011 (Sauer et al. 2012). The breeding population in Maine has been estimated at 500 red-tailed hawks based on BBS data (Rich et al. 2004). The number of red-tailed hawks observed in areas surveyed during the CBC has also shown general increasing trends within the State between 1966 and 2011 (NAS 2010).

The open grassland habitats of airports and the availability of perching structures often attract red-tailed hawks to airports where those birds pose a strike risk with aircraft. Most requests for assistance received by WS in Maine are associated with the threats red-tailed hawks pose to aircraft. However, WS does occasional receive requests associated with red-tailed hawks where damages or threats of damages to agricultural resources are occurring. For example, red-tailed hawks are known to capture and feed on free-ranging chickens. WS has addressed previous requests for assistance associated with red-tailed hawks with primarily non-lethal dispersal methods. From FY 2006 through FY 2011, the WS program in Maine employed non-lethal methods to trap and translocate nine red-tailed hawks from airports. Similar to the raptor species addressed previously, red-tailed hawks were live-captured using bal-chatri traps or Swedish Goshawk traps and translocated from areas where threats to human health and safety were occurring. All red-tailed hawks live-captured in traps were translocated to an area not less than 50 miles away and released into appropriate habitat. In addition, red-tailed hawks captured and translocated were banded for identification purposes using United States Geological Survey approved metal leg-bands appropriate for the species. Banding occurred pursuant to a banding permit issued by the United States Geological Survey.

Under the proposed action alternative, WS would continue to employ those live-traps for capturing red-tailed hawks and would continue to band and translocate hawks up to 50 miles. Based on previous requests for assistance and in anticipation of receiving additional requests for assistance at airports in the State, up to 30 red-tailed hawks could be live-captured and translocated annually. Although the live-capture and translocating of red-tailed hawks would be a non-lethal method of reducing damage, red-tailed hawks could be translocated during their nesting season, which could lower nesting success. Eggs are generally observed in nests of red-tailed hawks as early as mid- to late-March (Preston and Beane 2009). Nestlings are generally present in nests from late May through early July (Preston and Beane 2009).

Although the incubation of eggs can occur by either the male or female, incubation occurs primarily by the female while the male contributes a shorter amount of time to incubation each day (Preston and Beane 2009). Both the male and female red-tailed hawks feed the young once hatched; however, the female actually feeds the young more often while the male does more of the hunting (Preston and Beane 2009). Cooperative breeding has been documented in the red-tailed hawk, with two females and one male all working together (Preston and Beane 2009). Information on the nesting success of red-tailed hawks after the removal of one of the adults is not available.

The average clutch size for breeding pairs of red-tailed hawks is two to three eggs, with as many as four eggs being documented. If the live-capture and translocation of 30 red-tailed hawks resulted in 30 failed nests, the total number of fledglings produced in the State could be reduced by 120 red-tailed hawks if no other factors were considered. However, the annual reproductive success rate (*i.e.*, the percentage of nesting attempts that result in at least one fledgling) has been shown to be highly variable, but an 83% success rate is generally estimated for wild populations (Preston and Beane 2009). The rate of egg hatching success is 84% with nearly 73% of hatchlings reaching the fledgling stage (Preston and Beane 2009).

Although reduced nesting success could occur by removing one of the adult pairs of red-tailed hawks during the nesting season, available information indicates the successful raising of young could occur if only one adult was left to tend to the young. The degree of success would likely be related to the sex of the adult removed, the developmental stage of the eggs or nestlings, availability of food sources, and the time of year the removal of one of the adult pairs occurred. In addition, re-nesting has been documented for red-tailed hawks after nest failures (Preston and Beane 2009). If both adults were removed, the nest would not be successful.

WS could also be requested to employ lethal methods under the proposed action alternative to address damage or threats of damage associated with red-tailed hawks. Similar to the other raptor species addressed under the proposed action alternative, lethal take would only occur when birds were identified as being an immediate threat to human safety and/or property. Lethal take of one red-tailed hawk occurred by WS in the State from FY 2006 through FY 2011. According to the USFWS, two red-tailed hawks were taken by other entities in the State in 2010. The USFWS authorized the take of 30 red-tailed hawks by other entities in Maine during 2011. However, those entities reported no lethal take of red-tailed hawks in 2011.

Based on previous requests received by WS, up to 20 red-tailed hawks could be lethally removed by WS to alleviate damage. Based on a breeding population estimated at 500 red-tailed hawks, the lethal removal of up to 20 red-tailed hawks by WS would represent 4.0% of the estimated breeding population. If the USFWS continued to authorize the lethal take of up to 30 red-tailed hawks, in addition to the lethal take that could occur by WS, the cumulative take would be 50 red-tailed hawks, which would represent 10.0% of a stable breeding population. However, the lethal removal of red-tailed hawks is not likely to occur strictly during the breeding season. The number of red-tailed hawks present in the State likely increases during the migration periods as hawks move between breeding areas and wintering areas. In addition, the number of red-tailed hawks present in the State likely increases during the fall migration when juveniles are present. The number of red-tailed hawks present during the migration periods likely fluctuates. Therefore, the lethal removal of red-tailed hawks is likely to represent a lower percentage of the breeding population within the State. Rich et al. (2004) estimated the breeding population in the Atlantic Northern Forest region at 4,300 hawks. Take of up to 50 red-tailed hawks would represent 1.2% of the breeding population. Take by WS would only occur when permitted by the USFWS and the MDIFW and only at levels authorized, which ensures any take by WS would occur within allowable limits for the species.

American Kestrel Biology and Population Impact Analysis

The American kestrel is the smallest, most abundant, and most widespread species in the falcon family (Falconidae). American kestrels differ in color by gender. Males have blue-gray wings and a rufous tail with a single black band while females possess rufous-colored backs and wings with black bars (Smallwood and Bird 2002). American kestrels range throughout North America with the exception of the arctic areas and the Pacific Northwest, and extend into Central and South America. These birds use a wide variety of habitat types including many types of human-influenced environments such as pastures, golf courses, agricultural fields, parks, and urban areas (Elphick et al. 2001). Kestrels are capable of breeding as yearlings, of which about 80% do so. Average clutch size is most often four to five eggs, with an estimated 67% reproductive success (at least one fledgling) across their range. Double clutches occur occasionally with occurrences more common in their southern range (Smallwood and Bird 2002).

According to trend data available from the BBS, American kestrels are showing a declining trend in Maine estimated at -5.4% annually since the BBS was initiated in 1966 (Sauer et al. 2012). Between 2001 and 2011, the number of kestrels observed in areas surveyed during the BBS have shown a declining trend estimated at -5.9% annually (Sauer et al 2012). Since 1966, kestrels observed on BBS routes in the Atlantic Northern Forest (BCR 14) region have also shown a declining trend estimated at -2.2% annually, with a -1.4% annual decline occurring from 2001 through 2011 (Sauer et al. 2012). Trend data available from the CBC also indicates a decline in the number of kestrels wintering in Maine (NAS 2010). The breeding population of kestrels in Maine has been estimated at 9,000 birds with the population Atlantic Northern Forest region estimated at 44,500 kestrels (Rich et al. 2004). Information from the MDIFW substantiates the apparent declining trend observed during the BBS (C. Todd, MDIFW pers. comm. 2010), although kestrels continue to be very common in the State. Additionally, information from the Breeding Bird Atlas Explorer project indicates that American kestrels have been documented breeding throughout the State based on confirmed locations in 103 of 626 total blocks (282 blocks contained evidence) (Breeding Bird Atlas Explorer 2010).

American kestrels have been identified as potential predators to both young and adult T&E waterbirds (USDA 2012). In addition, WS has also received requests for assistance associated with kestrels posing aircraft strike risks at airports in the State. The WS program in Maine has previously employed non-lethal methods to address those requests for assistance to alleviate predation risks and damage threats at airports. Between FY 2007 and FY 2011, three kestrels have been captured and translocated by WS in the State. There has been no lethal take of kestrels by WS in Maine. According to the USFWS, no kestrels were lethally taken by any entities in the State of Maine between 2007 and 2011. However, the USFWS authorized the take of 30 kestrels by other entities in Maine during the same period.

Similar to the other raptors species, kestrels would primarily addressed using non-lethal methods, including translocation. Under the proposed action alternative, WS could live-capture kestrels using bal-chatri traps or Swedish Goshawk traps and translocate those birds from areas where threats to human health and safety were occurring. Kestrels live-captured in traps could be translocated to an area not less than 50 miles away and released into appropriate habitat. In addition, kestrels captured and translocated would be banded for identification purposes using United States Geological Survey approved metal leg-bands appropriate for the species. Banding would occur pursuant to a banding permit issued by the United States Geological Survey. Fair et al. (2010) stated "[w]*hen appropriate* [leg] *band sizes are used, the occurrence and rate of adverse effects on the subjects is ordinarily very low*". As a condition of depredation permits issued by the USFWS to WS, any translocation of raptors must be coordinated and/or approved with the MDIFW.

To alleviate threats of predation on T&E species associated with kestrels, WS anticipates that up to five kestrels could be live-captured using bal-chatri traps, pole traps, or Swedish Goshawk traps and translocated from areas where nesting occurs (USDA 2012). If translocation sites could not be located, kestrels live-captured could be relinquished to licensed bird rehabilitators to hold in captivity until after young T&E waterbirds have fledged and left the nesting area. The licensed bird rehabilitators would be responsible for the care and release of the kestrels back into the wild after the nesting season.

As discussed previously, kestrels have also been identified as strike hazards at airports within the State and WS could receive requests for assistance to alleviate those threats. Based on the requests for assistance received previously and in anticipation of additional efforts to manage threats posed by kestrels at airports and to alleviate predation risks, up to 20 kestrels could be live-captured and translocated under the proposed action and cumulatively across all WS' activities, including those activities to address threats of nest predation.

Although the live-capture and translocating of kestrels would be a non-lethal method of reducing predation risks, kestrels could be translocating during their nesting season which could lower nesting success. Eggs are generally observed in nests of kestrels beginning at the very end of March through mid-June with the peak period occurring from early April through mid May (Smallwood and Bird 2002). Nestlings are generally present in nests from early May through late August, with the peak occurring from the end of May through the end of July (Smallwood and Bird 2002).

Although the incubation of eggs can occur by either the male or female, incubation occurs primarily by the female while the male contribution to incubation appears to vary by individual males (Smallwood and Bird 2002). However, the eggs of kestrels appear to be relatively "*cold-hardy*" with embryos tending to develop more slowly rather than dying when neglect occurs or under temperature stress (Smallwood and Bird 2002). Both the male and female kestrels feed the young once hatched; however, the female kestrel appears to account for about 70% of the feeding (Smallwood and Bird 2002). Information on the nesting success of kestrels after the removal of one of the adults is not available.

The average clutch size for breeding pairs of kestrels is four to five eggs, with a range of one to seven eggs. If the live-capture and translocation of 20 kestrels resulted in 20 failed nests, the maximum number of fledglings produced in the State would be reduced by 140 kestrels if no other factors were considered. However, the annual reproductive success rate (*i.e.*, the percentage of nesting attempts that result in at least one fledgling) has been shown to be highly variable, but a 67% success rate is generally estimated for wild populations (Smallwood and Bird 2002). The rate of egg hatching has ranged from 62% to 89%, with nearly 90% of hatchlings reaching the fledgling stage (Smallwood and Bird 2002). In addition, 63% to 69% of first-year kestrels do not survive their first winter (Smallwood and Bird 2002). Kestrels are also known to re-nest after a nest failure.

Although reduced nesting success could occur by removing one of the adult pairs of kestrels during nesting, available information indicates the successful raising of young could occur if only one adult was left to tend to the young. The degree of success would likely be related to the sex of the adult removed, the developmental stage of the eggs or nestlings, availability of food sources, and the time of year the removal of one of the adult pairs occurred. If both adults were removed, the nest would not be successful.

As with other raptor species, WS would continue to employ primarily non-lethal methods to address damage and threats of damage. However, lethal take could occur when immediate threats to human safety or property occur, such as when kestrels return to airports once translocated or when habituation to non-lethal methods occur. Based on previous requests for assistance associated with kestrels posing strike risks at airports, WS could lethally remove up to 20 kestrels annually in the State to address those requests for assistance. However, no lethal take of kestrels would occur to alleviate nest predation. The lethal take of kestrels to alleviate nest predation of T&E species is discussed here to ensure activities are evaluated cumulatively.

There has been no lethal take of kestrels by WS in Maine previously. According to the USFWS, no kestrels were taken by any entities in the State of Maine between 2007 and 2011. However, the USFWS authorized the take of five kestrels by other entities in 2010 and 25 kestrels during 2011. The best available information estimated the statewide breeding population of American kestrels at 9,000 birds (Rich et al. 2004). Based on the best available population estimate, if WS' lethal take of kestrels reached 20 birds and if 25 kestrels were taken by other entities in the State, the cumulative take of American kestrels would represent 0.5% of the estimated statewide breeding population.

The take of kestrels, including live-capture and translocation, can only occur when permitted by the USFWS pursuant to the MBTA through the issuance of depredation permits. Therefore, all take, including take by WS, would be authorized by the USFWS and would occur at the discretion of the USFWS. In addition, lethal removal of kestrels could only occur when permitted by the MDIFW. The take of American kestrels by WS would only occur at levels authorized by the USFWS and the MDIFW.

Northern Harrier Biology and Population Impact Analysis

The northern harrier is a medium-sized raptor commonly found in upland grassland habitats and fresh- and saltwater marshes. The northern harrier is the most widely distributed harrier species breeding throughout North America and Eurasia (Smith et al. 2011). Like other harrier species, the northern harrier nests on the ground, usually in tall, dense clumps of vegetation (Smith et al. 2011). While foraging, northern harriers often fly low to the ground in search of small mammals and birds. The open grassland habitat associated with airports often provides ideal foraging conditions for northern harriers with most requests for assistance associated with harriers occurring at airports where the raptors pose an aircraft strike risk.

In Maine, northern harriers are commonly found during the breeding periods (Smith et al. 2011). The number of northern harriers observed along routes surveyed during the BBS conducted annually in the State has shown an increasing trend estimated at 1.6% since 1966, with a 1.7% annual increase occurring from 2001 through 2011 (Sauer et al. 2012). Across all routes surveyed in the Atlantic Northern Forest (BCR 14) region, the number of harriers observed has shown an increasing trend estimated at 1.5% annually since 1966, which is a statistically significant trend (Sauer et al. 2012). Between 2001 and 2011, the number of harriers observed during the BBS across all routes surveyed in the Atlantic Northern Forest has shown an increasing trend estimated at 2.0% annually (Sauer et al. 2012). Rich et al. (2004) estimated the breeding population in North America at nearly 436,000 harriers based on BBS data. The breeding population in Maine has been estimated at 300 harriers with 5,000 harriers breeding in the Atlantic Northern Forest region (Rich et al. 2004). Between 1966 and 2011, the number of harriers observed in areas surveyed during the CBC has shown a general increasing trend in the State; however, relatively few harriers are observed in the State during the CBC (NAS 2010). For example, the average number of harriers observed in areas surveyed during the CBC has been 12 harriers from the survey conducted in 2002 through the 2011 survey.

As mentioned previously, most requests for assistance associated with northern harriers would be received from airport authorities where harriers are posing an aircraft strike hazard. Previously, WS and other entities in the State have not employed lethal or non-lethal methods to take or disperse harriers to alleviate damage or threats of damage from 2006 through 2011. In anticipation of receiving requests for assistance associated with harriers, WS could be requested to alleviate threats of damage associated with harriers that could involve the lethal take of up to 20 harriers annually, which would represent 6.7% of the estimated breeding population.

Take would only occur at levels authorized by the USFWS and the MDIFW through the issuance of depredation permits. The permitting of take by the USFWS and the MDIFW would ensure those activities occur within allowable take levels to meet population objectives for harriers.

Wild Turkey Biology and Population Impact Analysis

Wild turkeys found in Maine consist of the Eastern wild turkey subspecies that is endemic to the eastern half of the United States. 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. 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 nearly extirpated from the State from over-hunting and habitat loss, the wild turkey now can be found nearly statewide in suitable habitat. During 1977, 41 wild turkeys were translocated from Vermont to Maine, which established the current sustained population in the State (MDIFW 2013*a*). Turkeys now occupy all 16 counties of the State. The number of turkeys observed in areas surveyed during the BBS has shown an increasing trend in the State estimated at 37.3% annually from 1966 through 2011, with a 37.0% annual increase from 2001 through 2011 (Sauer et al. 2012). The numbers of turkeys observed in the State during the CBC have been cyclical but have shown an overall increasing trend since 1966 (NAS 2010). Presently, approximately 50,000 to 60,000 wild turkeys are now distributed throughout the State in suitable habitat with populations continuing to increase in many parts of the State (K. Sullivan, MDIFW pers. comm. 2010).

Turkeys maintain sufficient densities within the State to allow for annual spring and fall hunting seasons. The number of turkeys harvested during the spring and fall seasons between 2006 and 2010 are shown in Table 4.9. The highest level of take between 2006 and 2010 occurred in 2007 when 7,827 turkeys were harvested. In total, 35,026 turkeys have been harvested in the State between 2006 and 2010, primarily during the spring turkey season. On average, 7,006 turkeys were harvested in the State during the hunting seasons each year between 2006 and 2010.

Table 4.9 - Maine wild turkey harvest, 2006-2010

Year	Spring Hunt	Fall Hunt	Total
2006	5,931	198	**6,129**
2007	5,984	1,843	**7,827**
2008	6,348	685	**7,033**
2009	6,043	712	**6,755**
2010	6,077	1,205	**7,282**

Requests for assistance received by the WS program in Maine to manage damage or threats of damage associated with wild turkeys occur primarily at dairy farms where turkeys are a health threat to livestock and at airports where turkeys can pose strike risks to aircraft. Between FY 2006 through FY 2011, WS has addressed 32 assistance requests to manage damage or threats of damage occurring within the State associated with turkeys. However, WS was not requested to provide direct operational assistance associated with turkeys in the State between FY 2006 and FY 2011. In FY 2010, one wild turkey was unintentionally killed in a padded foothold trap set by WS during other damage management activities.

Based on previous requests for technical assistance and in anticipation of receiving requests for direct operational assistance, WS could lethally take up to 50 wild turkeys annually under the proposed action alternative. With a statewide population estimated at 50,000 to 60,000 turkeys, take of up to 50 turkeys by WS would represent 0.08% to 0.1% of the estimated statewide population if the population in the State remains at least stable. The take of wild turkeys in the State by WS would only occur at levels permitted by the MDIFW. The MDIFW is responsible for managing the harvest of turkeys during the annual hunting seasons and the lethal removal of wild turkeys in the State to alleviate damage or threats of damage. When compared to the lethal take of turkeys during the annual hunting seasons, take of up to 50 turkeys by WS to alleviate damage or threats of damage would represent 0.7% of the average number of turkeys harvested in the State annually between 2006 and 2010. Take of up to 50 turkeys would represent 0.8% of the lowest harvest of turkeys in the State that occurred in 2006.

As state previously, most requests received previously by WS in the State were associated with threats associated with turkeys at airports, which are generally restricted areas and hunting is not permitted. Therefore, the take of turkeys by WS would not reach a magnitude where the ability to harvest turkeys in the State during the regulated seasons would be affected.

Rock Pigeon Biology and Population Impact Analysis

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

Pigeons are closely associated with humans where human structures and activities provide them with food and sites for roosting, loafing, and nesting (Williams and Corrigan 1994). Thus, pigeons are commonly found around city buildings, bridges, parks, farmyards, grain elevators, feed mills, and other manmade structures (Williams and Corrigan 1994). Additionally, although pigeons are primarily grain and seed eaters, they will readily feed on garbage, livestock manure, spilled grains, insects, and any other available bits of food (Williams and Corrigan 1994). In Maine, pigeons can be found statewide throughout the year and are considered a common resident of the State (Johnston 1992).

The number of pigeons observed along routes surveyed during the BBS in the State have shown an increasing trend since 1966 which has been estimated at 1.3% annually. From 2001 through 2011, the number of pigeons observed along routes surveyed has shown a decreasing trend estimated at -4.7% annually (Sauer et al. 2012). Since 1966, the number of pigeons observed along routes surveyed during the BBS across the Atlantic Northern Forest (BCR 14) has shown an increasing trend estimated at 2.7% annually with a 3.0% annually increase from 2001 through 2011, which is statistically significant (Sauer et al. 2012). Based on data from the BBS, Rich et al. (2004) estimated the statewide breeding population at 120,000 pigeons. The number of pigeons observed in areas surveyed during the CBC has shown a general increasing trend in the State since 1966 (NAS 2010).

Since pigeons are afforded no protection under the MBTA because the species is not native to the United States, the take of pigeons to alleviate damage or to reduce threats can occur without the need for a depredation permit from the USFWS or the MDIFW. Therefore, take by other entities in Maine is unknown. Between FY 2006 through FY 2011, WS received 30 requests for direct operational assistance to manage damage or threats of damage associated with rock pigeons in the State. Between FY 2006 and FY 2011, WS employed non-lethal harassment methods to disperse 50 and translocate 25 rock pigeons to alleviate damage or threats of damage. In addition, WS employed lethal methods to take 2,317 pigeons between FY 2006 through FY 2011.

The take of pigeons by other entities in the State to alleviate damage or threats of damage is unknown since the reporting of take to the USFWS or any other entity is not required. Since pigeons are a non-native species that often competes with native wildlife species for food and habitat, any take could be viewed as benefiting the native environment in Maine.

Based on previous requests for assistance and in anticipation of additional efforts, WS could annually take up to 3,000 pigeons in the State to alleviate damage. Based on a population estimated at 120,000 pigeons, take of up to 3,000 pigeons by WS would represent 2.5% of the estimated statewide population. WS' proposed activities involving pigeons would be conducted pursuant to Executive Order 13112, which states that each Federal agency should reduce invasion of exotic species and the associated damages.

Downy Woodpecker Biology and Population Impact Analysis

The smallest of the North American woodpeckers, downy woodpeckers are characterized not only by their size but also by their relatively short stubby bill (Jackson and Ouellet 2002). Downy woodpeckers can be found across North America, including Maine, throughout the year in suitable habitat (Jackson and Ouellet 2002). These woodpeckers prefer open, deciduous woodlands including urban and suburban parks and residential areas (Jackson and Ouellet 2002). Downy woodpeckers excavated cavities in rotting wood of living or dead trees for nests (Jackson and Ouellet 2002). The diet of downy woodpeckers consists of insects, fruits, seed, and sap (Jackson and Ouellet 2002). Downy woodpeckers use their bill to excavate insects from bark or other substrate (Jackson and Ouellet 2002). Like other species of woodpeckers, downy woodpeckers use drumming as a means of communication. Drumming occurs year-round but seems to be more intense in both the winter and spring (Jackson and Ouellet 2002).

The number of downy woodpeckers observed in areas surveyed within the State during the BBS has shown an increasing trend since 1966 estimated at 0.5% annually. However, from 2001 through 2011, the number of downy woodpeckers observed in areas surveyed during the BBS has shown a declining trend estimated at -0.2% annually (Sauer et al. 2012). Rich et al. (2004) estimated the breeding population of downy woodpeckers in Maine at 110,000 woodpeckers. In the Atlantic Northern Forest region, the number of down woodpeckers observed during the BBS has increased annually since 1966 estimated at 0.9% with a 0.5% annual increase occurring from 2001 through 2011 (Sauer et al. 2012). The number of downy woodpeckers observed in areas surveyed during the CBC in the State has shown an overall stable trend since 1966 (NAS 2010).

Requests for assistance associated with down woodpeckers occur when these birds chisel holes in the wooden siding, eves or trim of buildings or drum on these surfaces or on metal gutters, chimney caps, vents or roofing materials (Evans et al. 1984, Marsh 1994). In Tennessee, Evans et al. (1984) reported that 48% of woodpecker damage to homes surveyed involved holes that had completely penetrated the building material (usually wood). Although drumming causes less damage, the noise created by drumming often reverberates through the building and because most activity occurs early in the day (Evans et al. 1984), the noise can be very annoying when occupants are still asleep (Marsh 1994).

WS has not received requests for direct operational assistance associated with downy woodpeckers. However, woodpeckers often cause damage to property when they create holes in the siding of buildings in search of food or by excavating nesting cavities on the side of buildings. The USFWS authorized take of up to 12 downy woodpeckers in 2007 and up to 15 downy woodpeckers in 2008. According to the USFWS, seven downy woodpeckers were taken in 2007 by other entities in Maine. In anticipation of receiving requests to alleviate damage associated with down woodpeckers, WS anticipates that up to five downy woodpeckers could be lethally removed annually.

If the population of downy woodpeckers remains stable, take of up to five downy woodpeckers by WS would represent 0.01% of the estimated statewide breeding population. Using the highest authorized annual take by all entities of up to 15 woodpeckers and including WS' take of up to five woodpeckers annually, the cumulative take could reach 20 woodpeckers annually. Based on a population estimated at 110,000 downy woodpeckers, the cumulative take by all entities in the State would represent 0.02% of the estimated population in the State if the population remains at least stable.

Hairy Woodpecker Biology and Population Impact Analysis

A small to medium sized woodpecker, the hairy woodpecker can be found across much of North America, including Maine, throughout the year (Jackson et al. 2002). Hairy woodpeckers occupy both deciduous and coniferous forest habitat but they can also be found in urban and suburban parks and residential areas (Jackson et al. 2002). Like most woodpeckers, hairy woodpeckers excavate holes in dead or live trees for nesting (Jackson et al. 2002). The diet of the hairy woodpecker consists of seeds, fruits, and insects (Jackson et al. 2002). Insects are either located visually or by rapid bill drumming, which presumably allows the bird to locate the tunnels of wood-boring insects (Jackson et al. 2002). The woodpecker then chisels away bark and wood to extract the insect (Jackson et al. 2002). Sizeable holes (greater than 2 inches deep) can be made during this process (Jackson et al. 2002). Like other species of woodpeckers, hairy woodpeckers use drumming not only as a means to obtain food or excavate a nest cavity but also as a means of communication. Hairy woodpeckers drum throughout the year for a variety of reason including maintaining territories and soliciting mates (Jackson et al. 2002).

In Maine, the number of hairy woodpeckers observed during the BBS has shown an increasing trend estimated at 1.5% annually since 1966, with a 1.6% annual increase occurring from 2001 through 2011 (Sauer et al. 2012). The number of hairy woodpeckers observed in the Atlantic Northern Forest region has increased 1.7% annually since 1966, with a 1.9% annual increase occurring from 2001 through 2011 (Sauer et al. 2012). The number of hairy woodpeckers observed in the State during the CBC has shown a declining trend from 1966 through the mid-1990s; however, from the mid-1990s through 2011, the number of woodpeckers observed has shown increasing trends (NAS 2010). Using data from the BBS, Rich et al. (2004) estimated the statewide breeding population of hairy woodpeckers to be 100,000 birds.

No hairy woodpeckers have been harassed or lethally removed by WS previously; however, hairy woodpeckers are also known to cause damage to structures or resources in Maine, similar to downy woodpeckers. The USFWS authorized the lethal removal of up to 12 hairy woodpeckers in 2007 and 15 woodpeckers in 2008. However, the lethal removal of hairy woodpeckers was only reported in 2007 when seven woodpeckers were removed to alleviate damage. In anticipation of receiving requests to alleviate damage associated with hairy woodpeckers, WS anticipates that up to five hairy woodpeckers could be lethally removed annually to alleviate damage.

The best available data estimates the breeding population of hairy woodpeckers in Maine at 100,000 woodpeckers (Rich et al. 2004). Based on this estimate, the annual removal of up to five hairy woodpeckers by WS under the proposed action alternative would represent 0.01% of the estimated breeding population. The highest authorized take of hairy woodpeckers occurred in 2008 when the USFWS authorized the lethal removal of 15 woodpeckers to alleviate damage or threats of damage. If the USFWS continued to authorize the lethal removal of 15 hairy woodpeckers annually and if WS' annual take reached five woodpeckers, the cumulative take would be 20 hairy woodpeckers annually. Based on a statewide breeding population estimated at 100,000 hairy woodpeckers, the cumulative lethal removal of

20 hairy woodpeckers would represent 0.02% of the breeding population, if the population remains at least stable.

The take of hairy woodpeckers could only occur when permitted by the USFWS and the MDIFW through the issuance of depredation permits. Therefore, all take, including take by WS, would have to be authorized by the USFWS and the MDIFW. Take of hairy woodpeckers would only occur at levels authorized by the USFWS and the MDIFW. Therefore, the USFWS and the MDIFW would ensure cumulative take would be considered as part of population management objectives for hairy woodpeckers.

Pileated Woodpecker Biology and Population Impact Analysis

Pileated woodpeckers are the largest woodpecker in North America and are a permanent resident of the deciduous, coniferous, and mixed forests in southern Canada and in the western, midwestern, and eastern United States. Because of their size and strong bill, the pileated woodpecker is particularly adept at excavating, and it uses this ability to construct nest and roost cavities and to find food. Pileated woodpeckers excavate nest cavities in dead and deteriorating living trees and typically roost in hollow dead trees (Bull and Jackson 2011). Only large-diameter trees have enough girth to contain nest and roost cavities; therefore, old growth forests are the ideal habitat for the pileated woodpecker. The pileated woodpecker feeds primarily on wood-dwelling ants and beetles that are found in live and dead trees. A pair of woodpeckers will defend their territory throughout the year and will not abandon a territory even when one of the pair dies. The availability of suitable habitat appears to be the factor limiting most populations of pileated woodpeckers (Bull and Jackson 2011).

Pileated woodpeckers can be found throughout the year in Maine (Bull and Jackson 2011). The number of pileated woodpeckers observed during the BBS has increased approximately 4.7% annually in Maine, with an 8.0% increase occurring from 2001 through 2011 (Sauer et al. 2012). In the Atlantic Northern Forest region, the number pileated woodpeckers observed in areas surveyed during the BBS has shown an increasing trended estimated at 4.3% annually since 1966 and 5.2% annually from 2001 through 2011 (Sauer et al. 2012). The breeding population of pileated woodpeckers in the State has been estimated at 15,000 woodpeckers based on data from the BBS (Rich et al. 2004). The number of pileated woodpeckers observed in areas surveyed during the CBC in Maine has also shown a general increasing trend since 1966 (NAS 2010).

Most requests for assistance are associated with damage to property caused by pileated woodpeckers excavating holes in buildings, homes, or wooden utility poles. In 2008, the USFWS authorized other entities to lethally removal of up to three pileated woodpeckers in Maine to alleviate damage; however, no take was reported. To alleviate damage during FY 2010, WS lethally removed one pileated woodpecker at the request of a property owner. Based on the level of assistance provided previously, it is anticipated that WS could lethally remove up to five pileated woodpeckers annually in the State to alleviate damage.

The lethal removal of up to five pileated woodpeckers by WS would represent 0.03% of the statewide breeding population estimated at 15,000 woodpeckers, if the population remains at least stable. If the USFWS authorized other entities to lethally removal five additional woodpeckers annually, the cumulative take would represent 0.07% of the estimated breeding population, if the breeding population remains at least stable.

Similar to most of the other bird species, the take of pileated woodpeckers could only occur when permitted by the USFWS and the MDIFW through the issuance of depredation permits. Therefore, all take, including take by WS, would have to be authorized by the USFWS and the MDIFW. Take of pileated woodpeckers would only occur at levels authorized by the USFWS and the MDIFW. Therefore, the USFWS and the MDIFW would ensure cumulative take would be considered as part of population management objectives for pileated woodpeckers.

American Crow Biology and Population Impact Analysis

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 sometimes form 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 year across the State (Robbins and Blom 1996).

Historically, crow populations have likely 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. Those large flocks disperse to different feeding areas during the day. Crows can fly from six to 12 miles from the roost to a feeding site each day (Johnson 1994). Large fall and winter crow roosts may cause serious problems in some areas particularly when located in towns or other sites near people.

As discussed previously, blackbirds, including crows, can be lethally removed without the need for a depredation permit issued by the USFWS pursuant to the blackbird depredation order when they commit or are about to commit damage (see Chapter 1). In addition, when blackbirds are posing a threat to human safety, blackbirds can be taken under the blackbird depredation order without the need for a specific depredation permit. In addition, crows can be harvested in the State during a regulated season that allows an unlimited number of crows to be harvested during the length of the season. Since take of crows can occur without a permit from the USFWS under the blackbird depredation order, there has been no previous reporting requirements for the take of crows to reduce damage or reduce threats. Therefore, the number of crows taken in the State under the depredation order to alleviate damage or reduce threats is currently unknown. Similarly, hunters harvesting crows during the regulated hunting season are not required to report their take to the USFWS or the MDIFW; therefore, the number of crows harvested annually in the State is unknown.

From FY 2007 through FY 2011, WS addressed damage or reduced threats associated with 7,570 American crows. Of those 7,570 crows addressed by WS, 70 crows were lethally taken to alleviate damage or threats while 7,500 crows were addressed using non-lethal methods. The highest level of crow take by WS occurred in FY 2010 when 29 crows were addressed using lethal methods in the State. WS addressed 7,500 crows in FY 2009 using non-lethal methods. Based on previous requests for assistance and in anticipation of additional efforts, up to 2,000 American crows could be lethally taken annually by WS to alleviate damage.

WS could also be requested to address crows that are feeding on the eggs and nestlings of ground-nesting bird species in Maine, which was discussed and evaluated in a separate analysis (USDA 2012). As was addressed in that EA (USDA 2012), the cumulative take of crows by WS, including crows that could be taken to alleviate nest predation, would not exceed 2,000 crows annually during all damage management activities. To ensure a cumulative analysis of the potential take of crows to alleviate damage and to reduce risks of nest predation, this EA will evaluate the lethal take of up to 2,000 crows annually; however, take of crows to alleviate nest predation would not exceed 200 crows.

American crows have a wide range and are extremely abundant, being widely distributed over much of North America, including most of the United States (Johnson 1994, NAS 2000). American crow populations increased drastically after protection under the MBTA. Populations tend to be densest and increasing most rapidly in urban areas of North America (Marzluff et al. 2001). In the United States, some crow roosts may reach a half-million birds or greater in size (Johnson 1994, NAS 2000). From 1966 through 2011, the number of American crows observed in areas surveyed in the State during the BBS has increased 1.6% annually (Sauer et al. 2012). From 2001 through 2011, the number of crows observed in the State has increased 1.7% annually (Sauer et al. 2012). In the Atlantic Northern Forest region, the number of crows observed during the BBS has increased 1.1% annually from 1966 through 2011 and 1.2% annually from 2001 through 2011 (Sauer et al. 2012). Rich et al. (2004) estimated the breeding American crow population in Maine to be 270,000 individuals. The number of crows observed during winter surveys has shown a general increasing trend in the State (NAS 2010).

Based on the estimated breeding population derived by Rich et al. (2004) using BBS data, the potential take by WS of up to 2,000 crows would represent 0.7% of the estimated breeding crow population in Maine. As discussed previously, crows can be taken under the blackbird depredation order to alleviate damage or threats and crows can be harvested during an annual hunting season. However, the number of crows lethally taken during the hunting season and the number lethally taken to alleviate damage is currently unknown.

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 overharvest by restricting take (either through hunting season regulation and/or permitted take) to ensure that annual harvests occur 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. The number of American crows observed during statewide surveys continues to show increasing annual trends (NAS 2010, Sauer et al. 2012), which provides an indication that previous cumulative take has not caused overharvest of the population. Overharvest of the statewide crow population would result in population declines, which have not been observed within the State based on data from the CBC and the BBS. Therefore, the statewide population has 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. Based upon population trend data, the wide abundance of this bird species and WS' lethal management actions potentially representing 0.7% of the estimated statewide population, WS' management actions would be of low magnitude if take reached 2,000 crows.

Common Raven Biology and Population Impact Analysis

Common ravens can be found throughout a major portion of the forested areas of North America and is considered one of the most widespread naturally occurring bird species in the world. Ravens can be found throughout Europe, Asia, and North Africa (Boarman and Heinrich 1999). In most areas, ravens are a considered a permanent resident found throughout the year. Ravens rely heavily on scavenging carrion and human garbage. Ravens will also feed on rodents, eggs, nestlings, insects, seeds, grains, and fruits (Boarman and Heinrich 1999). Ravens typically nest on cliffs or in trees. Ravens build nests and begin laying eggs from mid-February to late-May, although most eggs are laid from early March to mid-April (Boarman and Heinrich 1999).

In the early 1900s, raven populations in North America were well below previous levels and extirpated from much of their former range due to human persecution and habitat loss (Boarman and Heinrich 1999). Raven populations began to rebound in the 1950s and by the 1960s ravens could be found in much of their former range (Boarman and Heinrich 1999). Today, common ravens are widely distributed across much of the western and northeastern United States, including Maine.

Ravens can be found statewide in Maine and are present throughout the year (Boarman and Heinrich 1999). The number of ravens observed from 1966 through 2011 in areas surveyed during the BBS has shown an increasing trend that has been estimated at 1.4% annually (Sauer et al 2012). Between 2001 and 2011, the number of ravens observed in the State during the BBS has increased 1.9% annually (Sauer et al. 2012). Rich et al. (2004) estimated the breeding population in Maine to be 12,000 ravens based on BBS data. Across the Atlantic Northern Forest region, the number of ravens observed in areas surveyed during the BBS has also increased from 1966 through 2011 estimated at 0.6% annually, with a 0.9% annual increasing occurring from 2001 through 2011 (Sauer et al. 2012). However, the number of ravens observed in areas surveyed in the State during the CBC has shown a general declining trend since 1966 (NAS 2010).

As raven populations have expanded and are increasingly adapting to human presence, requests for assistance with managing damage could also increase. Requests for assistance associated with ravens are often associated with damage to agricultural resources, property, and threats to human safety. For example, ravens are known to peck out the eyes of newborn lambs (Boarman and Heinrich 1999). Requests for assistance could also arise from residents near landfills where ravens transport refuse from the landfill to residential areas to feed. Ravens could also pose aircraft strike risks at airports within the State.

To alleviate damage, WS lethally removed one raven during FY 2010. No other lethal removal occurred by WS from FY 2006 through FY 2011. The USFWS has previously authorized the lethal removal of up to five ravens per year to other entities within Maine. Entities reported the lethal removal of one raven in 2008 and three ravens were lethally removed by other entities in 2009 pursuant to depredation permits.

Based on previous requests for assistance and in anticipation of additional efforts to address damage, WS could lethally remove up to 100 ravens annually in the State. Based on a statewide breeding population estimated at 12,000 individuals, the lethal removal of 100 ravens by WS would represent 0.8% of the population. If the USFWS continued to authorize other entities to remove up to five ravens per year, the cumulative take of ravens would represent 0.9% of the estimated statewide breeding population.

Like most of the other bird species addressed in this EA, the take of ravens could only occur when permitted by the USFWS and the MDIFW through the issuance of depredation permits. Therefore, all take, including take by WS, would have to be authorized by the USFWS and the MDIFW. Take of ravens would only occur at levels authorized by the USFWS and the MDIFW. Therefore, the USFWS and the MDIFW would ensure cumulative take would be considered as part of population management objectives for ravens.

European Starling Biology and Population Impact Analysis

Colonization of North America by the European starling began on March 6, 1890 when a member of the Acclimatization Society, released 80 starlings into Central Park in New York. The released starlings were able to exploit the habitat resources in the area and were able to become established in the area. By 1918, the range of migrant juveniles extended from Ohio to Alabama. By 1926, the distribution of starlings in the United States had moved westward and encompassed an area from Illinois to Texas. By 1941, further westward expansion had occurred and starlings were known to occur and breed from Idaho to New Mexico. By 1946, the range of starlings had expanded to California and western Canadian coasts (Miller 1975). In just 50 years, the starling had colonized the United States and expanded into Canada and Mexico and 80 years after the initial introduction had become one of the most common birds in North America (Feare 1984). The first record of European starlings in Maine occurred in 1916 as their range expanded into southern Vermont, New Hampshire, and Maine, to and including Portland, Maine. In 1922, there was a marked extension of the starling range, when the limits included Waterville and

Burnham, Maine (Cooke 1928). Today, starlings can be found throughout the State and are considered common permanent residents.

From 1966 through 2011, the number of starlings observed along routes surveyed during the BBS has shown a declining trend in the State estimated at -4.1% annually, with a -4.4% decline annually occurring from 2001 through 2011 (Sauer et al. 2012). Using data from the BBS, Rich et al. (2004) estimated the statewide breeding population of starlings at 710,000 birds. Across all routes surveyed in the United States during the BBS, the number of starlings observed has shown a declining trend estimated at a rate of -1.0% annually from 1966 through 2011 (Sauer et al. 2012). The number of starlings observed in those areas surveyed during the CBC in the State has shown a cyclical pattern from 1966 through 2011 with a general overall declining trend (NAS 2010).

Starlings are not native to Maine and are afforded no protection under the MBTA or any State law. Therefore, a depredation permit from the USFWS or the State is not required to remove starlings to alleviate damage or threats of damage. Since the take of starlings to alleviate damage or threats of damage is not reported to the USFWS or the MDIFW, the lethal take of starlings in the State to alleviate damage or threats of damage by entities other than WS is unknown.

Based on the flocking behavior of starlings and the potential for damage or threats of damage to arise from that behavior, WS anticipates that up to 10,000 starlings could be lethally taken annually in the State to alleviate damage or threats of damage. Between FY 2006 and FY 2011, WS has responded to requests for assistance to reduce starling damage and killed 17,199 starlings. In anticipation of receiving requests for assistance to manage damage and threats associated with a large starling roost, take of up to 10,000 starlings could occur despite the limited take that has occurred since FY 2006. The take of 10,000 starlings would represent 1.4% of the estimated 710,000 starlings breeding in the State. However, most requests to address large roosts occur during the migration periods and during the winter when the population in the State likely increases above the 710,000 starlings estimated to nest in the State. The increase in the population would be a result of the arrival of migrants into the State and the presence of juveniles in the population.

Executive Order 13112 states that each federal agency shall reduce invasions of exotic species and reduce the associated damages to the extent practicable and permitted by law. WS' take of European starlings to reduce damage and threats would comply with Executive Order 13112.

Red-winged Blackbird Biology and Population Impact Analysis

The red-winged blackbird is one of the most abundant bird species in North America and is a commonly recognized bird that can be found in a variety of habitats (Yasukawa and Searcy 1995). The breeding habitat of red-winged blackbirds includes marshes and upland habitats from southern Alaska and Canada southward to Costa Rica extending from the Pacific to the Atlantic Coast along with the Caribbean Islands (Yasukawa and Searcy 1995). Red-winged blackbirds are primarily associated with emergent vegetation in freshwater wetlands and upland habitats during the breeding season; however, red-winged blackbirds will nest in vegetation associated with roadside ditches, saltwater marshes, rice paddies, hay fields, pastureland, fallow fields, suburban habitats, and urban parks (Yasukawa and Searcy 1995). Northern breeding populations of red-winged blackbirds migrate southward during the migration periods but red-winged blackbirds are common year-round residents in States along the Gulf Coast and parts of the western United States (Yasukawa and Searcy 1995). During the migration periods, red-winged blackbirds often form mixed species flocks with other blackbird species.

In Maine, red-winged blackbirds are present during the breeding season and migration periods, with some blackbirds present along the coast during the winter depending on the severity (Yasukawa and Searcy

1995). Rich et al. (2004) estimated the statewide breeding population at 300,000 blackbirds. Trend data from the BBS indicates the number of red-winged blackbirds observed in the State during the breeding season has shown a declining trend since 1966 estimated at -2.1% annually (Sauer et al. 2012). More recent trend data from 2001 through 2011 also indicates a downward trend estimated at -2.2% annually (Sauer et al. 2012). Across all survey routes in the Atlantic Northern Forest region, the number of red-winged blackbirds observed has shown downward trends since 1966 estimated at -1.9% annually (Sauer et al. 2012).

The number of red-winged blackbirds observed during the CBC in the State has shown a cyclical pattern since 1966, with a general overall declining trend (NAS 2010); however, only a small number of blackbirds are observed annually in areas surveyed in the State during the CBC. Most blackbirds migrate from the State during the winter (Yasukawa and Searcy 1995).

Outside of the nesting season, blackbirds generally feed and roost in flocks varying from a few birds to over a million birds (Dolbeer 1994). Feeding flocks and roosting congregations are sometimes comprised of a single species, but often several species are mixed together. In Maine, winter flocks are often composed of birds and migrants from Canada and the northern United States along with birds that are present in the State throughout the year. The tendency of blackbirds and starlings to form large communal roosts in agricultural producing areas of the State and to travel and feed in large social flocks often results in locally serious damage to crops. Monetary losses to individual agricultural producers can be substantial (Glahn and Wilson 1992). Accumulations of fecal droppings under areas where large congregations of blackbirds and starlings roost, loaf, or feed can cause damage to or pose threats of damage to a variety of resources in Maine. Reports of damages or threats of damage from accumulations of fecal droppings have occurred at dairies and livestock feedlots (*e.g*., consumption and contamination of feed). Accumulations of fecal droppings can damage buildings and other property (*e.g*., damage to structures from the acid in fecal droppings) and pose disease risks to people and animals (*e.g*., fecal droppings in public use areas). In addition, large flocks of blackbirds and accumulations of fecal droppings can be aesthetics displeasing (*e.g*., noise, smell). Requests for assistance associated with blackbirds are most likely to occur during the migration periods when blackbirds congregate in large flocks.

As discussed in Chapter 1, the USFWS has established a depredation order (see 50 CFR 21.43) for blackbirds. Under the order, a depredation permit is not required to remove blackbirds if they are committing or about to commit depredations upon ornamental or shade trees, agricultural crops, livestock, or wildlife, or when concentrated in such numbers and manner as to constitute a health hazard or other nuisance. Since a depredation permit is not required for the take of red-winged blackbirds, the number taken annually has not previously been reported to the USFWS. Therefore, the annual take of red-winged blackbirds to alleviate damage or threats of damage under the depredation order in previous years is unknown.

Between FY 2006 and FY 2011, WS did not receive requests for assistance associated with red-winged blackbirds; however, WS could be requested to provide assistance with managing damage. In anticipation of receiving requests for assistance, WS could take up to 300 red-winged blackbirds annually under the proposed action alternative to alleviate damage. With an estimated breeding population of 300,000 blackbirds in the State, take of up to 300 red-winged blackbirds would represent 0.1% of the population. Since a depredation permit is not required for the take of red-winged blackbirds, the number taken annually previously was not reported to the USFWS. Therefore, the annual take of red-winged blackbirds to alleviate damage or threats of damage under the depredation order is currently unknown.

Common Grackle Biology and Population Impact Analysis

Another blackbird species commonly found in mixed species flocks in Maine is the common grackle. Common grackles are a semi-colonial nesting species often associated with human activities. Characterized by yellow eyes and iridescent bronze or purple plumage, common grackles are a common conspicuous bird species found in urban and residential environments (Peer and Bollinger 1997). The breeding range of the common grackle includes Canada and the United States east of the Rocky Mountains with grackles found throughout the year in the United States except for the far northern and western portion of the species range in the United States (Peer and Bollinger 1997). Common grackles have likely benefited from human activities, such as the clearing of forests in the eastern United States, which provided suitable nesting habitat. In addition, the planting of trees in residential areas has likely led to an expansion of the species range into the western United States (Peer and Bollinger 1997). 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 fruits (Bull and Farrand 1977, Peterson 1980).

Common grackles can be found during the breeding season in the State with some individuals present throughout the year in the extreme southeast portion of the State near the coast (Peer and Bollinger 1997). Rich et al. (2004) estimated the breeding population to be 400,000 grackles. The number of common grackles observed along routes surveyed during the BBS has shown a declining trend since 1966, which has been estimated at -2.5% annually (Sauer et al. 2012). Between 2001 and 2011, the number grackles observed during the BBS has shown a declining trend estimated at -4.1% annually (Sauer et al. 2012). A downward trend has also been observed for grackles observed along BBS routes across the Atlantic Northern Forest region, which has been estimated at -1.5% annually since 1966 (Sauer et al. 2012). Across the United States, the number of common grackles observed during the annual BBS has also shown a downward trend estimated at -1.7% since 1966 (Sauer et al. 2012).

The number of grackles observed in the State during the annual CBC surveys has shown an overall declining trend since 1966 (NAS 2010); however, relatively few grackles are observed in areas surveyed during the CBC within the State since most grackles migrate through Maine to wintering areas further south.

Most requests for assistance involving common grackles would be associated with mixed species flocks of blackbirds where grackles were present. Since common grackles could be present in mixed species flocks of blackbirds, WS could be requested to employ lethal methods to take up to 100 common grackles annually. Like other blackbird species, the take of common grackles can occur under the blackbird depredation order, which allows blackbirds, including common grackles, to be taken when committing damage or about to commit damage without the need for a depredation permit from the USFWS. Therefore, the number of common grackles taken annually by other entities in the State has been unknown.

If up to 100 common grackles were taken annually by WS, the take would represent 0.03% of the estimated 400,000 common grackles breeding within the State. The take of common grackles by other entities is expected to be of low magnitude when compared to the statewide estimated breeding population in Maine.

Brown-headed Cowbird Biology and Population Impact Analysis

Brown-headed cowbirds are another species of the blackbird family commonly found in mixed species flocks during migration periods. Cowbirds are a common summer resident across the United States and southern Canada (Lowther 1993). Breeding populations in the northern range of the cowbird are migratory with cowbirds present year-round in much of the eastern United States and along the west Coast (Lowther 1993). Likely restricted to the range of the bison (*Bison bison*) before the presence of

European settlers, cowbirds were likely a common occurrence on the short-grass plains where they fed on insects disturbed by foraging bison (Lowther 1993). Cowbirds began expanding their breeding range as people began clearing forests for agricultural practices (Lowther 1993). Cowbirds are still commonly found in open grassland habitats but also inhabit urban and residential areas. Unique in their breeding habits, cowbirds are known as a brood parasite, which means they lay their eggs in the nests of other bird species (Lowther 1993). Female cowbirds can lay up to 40 eggs per season with eggs reportedly being laid in the nests of over 220 species of birds. Of those 220 bird species, 144 species have actually raised cowbird young (Lowther 1993). No parental care is provided by cowbirds, with the raising of cowbird young occurring by the host species. The preferred foods of brown-headed cowbirds include insects, small fruits, wild seeds, grain, and small aquatic life (Peterson 1980).

In Maine, the number of cowbirds observed in areas surveyed during the BBS has shown a declining trend estimated at -5.1% annually between 1966 and 2011 (Sauer et al. 2012). From 2001 through 2011, the number of cowbirds observed in the State has shown a declining trend estimated at -6.6% annually (Sauer et al. 2012). In the Atlantic Northern Forest region, cowbirds have shown a declining trend since 1966 estimated at -6.0%, annually, with a -6.2% annual decline occurring from 2001 through 2011 (Sauer et al. 2012). Across all BBS routes surveyed in the United States since 1966, the number of cowbirds observed has shown a declining trend estimated at -0.3% annually; however, from 2001 through 2011, the number of cowbirds observed has shown an increasing trend estimated at 0.7% annually (Sauer et al. 2012). Similar to other blackbird species, the number of cowbirds observed during the CBC conducted annually in the State has shown a downward trend since 1966 (NAS 2010).

WS has not previously received requests for assistance directly associated with brown-headed cowbirds in the State. Since cowbirds could be present in mixed species flocks of blackbirds, WS could lethally take up to 100 cowbirds annually in the State to alleviate damage or threats of damage. Like other blackbird species, the take of cowbirds can occur pursuant to the blackbird depredation order without the need for a depredation permit from the USFWS; therefore, the number of cowbirds taken annually by other entities to alleviate damage or threats of damage in the State is currently unknown. However, the take of cowbirds by other entities to alleviate damage or threats is likely non-existent to minimal in the State. The take of brown-headed cowbirds by other entities is expected to be of low magnitude when compared to the statewide estimated population for Maine.

Based on a statewide breeding population estimated at 140,000 cowbirds (Rich et al. 2004), take of up to 100 cowbirds by WS to alleviate damage or threats of damage would represent 0.07% of the estimated population. The take of cowbirds by other entities to alleviate damage or threats of damage under the blackbird depredation order is not likely to reach a level where cumulative adverse effects to the species' population would occur. Although cowbirds can cause damage or pose threats of damage, most take of cowbirds by WS would be the result of addressing flocks of mixed species flocks of blackbirds. That take is not likely to reach a level where adverse effects on the species' population would occur and would be of low magnitude when compared to the statewide population of cowbirds and trend data.

House Sparrow Biology and Population Impact Analysis

House sparrows were introduced to North America from England in 1850. From that introduction, sparrows have spread throughout the continent (Fitzwater 1994). House sparrows are found in nearly every habitat except dense forest, alpine, and desert environments. They prefer human-altered habitats and are abundant on farms and in cities and suburbs (Robbins et al. 1983). House sparrows are not considered migratory in North America and are considered year-round residents wherever they occur, including those sparrows found in Maine (Lowther and Cink 2006). Nesting locations often occur in areas of human activities and are considered "*...fairly gregarious at all times of year*" with nesting occurring in small colonies or in a clumped distribution (Lowther and Cink 2006). Large flocks of sparrows can also be found in the winter as birds forage and roost together.

According to BBS trend data provided by Sauer et al. (2012), between 1966 and 2011, the number of house sparrows observed along routes surveyed across the United States have shown a statistically significant downward trend estimated at -3.7% annually. In Maine, the number of house sparrows observed in areas surveyed during the BBS has also shown a downward trend between 1966 and 2011 estimated at -3.2% annually (Sauer et al. 2012). Rich et al. (2004) estimated the breeding population of house sparrows in the State to be 80,000 birds. Since 1966, the number of house sparrows observed in areas surveyed in the State during the CBC has shown an overall declining trend (NAS 2010).

Robbins (1973) suggested that declines in the sparrow population must be largely attributed to changes in farming practices, which resulted in cleaner operations. One aspect of changing farming practices which might have been a factor would be the considerable decline in small farms and associated disappearance of a multitude of small feed lots, stables and barns, a primary source of food for these birds in the early part of the 20th century. Ehrlich et al. (1988) suggested that house sparrow population declines might be linked to the dramatic decrease during the 20th century in the presence of horses as transport animals. Grain rich horse droppings were apparently a major food source for this species.

House sparrows are non-indigenous and often have negative effects on native birds, primarily through competition for nesting sites. Therefore, sparrows are considered by many wildlife biologists and ornithologists to be an undesirable component of North American wild and native ecosystems. Any reduction in house sparrow populations in North America, even to the extent of complete eradication, could be considered as providing some benefit to native bird species. House sparrows are afforded no protection from take under the MBTA or State laws.

Between FY 2006 and FY 2011, WS has employed non-lethal methods to disperse 700 sparrows and lethal methods to remove 603 house sparrows in the State to alleviate damage or threats of damage. Since house sparrows are afforded no protection from take under the MBTA, no depredation permits are issued for the take of house sparrows and there are no requirements to report take of sparrows. Therefore, the number of sparrows lethally removed by other entities in the State is unknown. Based on the gregarious behavior of sparrows and in anticipation of additional efforts, WS could take up to 800 house sparrows in the State annually to alleviate damage or threats of damage.

If up to 800 sparrows were lethally removed by WS annually in the State, the take would represent 1.0% of the statewide breeding population if the population were at least stable. As stated previously, the annual take of house sparrows by other entities is currently not known. Since house sparrows are a non-native species that often competes with native wildlife species for food and habitat, any take could be viewed as providing some benefit to the native environment in Maine. WS' take of house sparrows to reduce damage and threats would comply with Executive Order 13112.

Wildlife Disease Surveillance and Monitoring

The ability to efficiently conduct surveillance for and detect diseases is dependent upon rapid detection of the pathogen if it is introduced. Effective implementation of a surveillance system would facilitate planning and execution at regional and state levels, and coordination of surveillance data for risk assessment. It would also facilitate partnerships between public and private interests, including efforts by federal, state, and local governments as well as non-governmental organizations, universities, and other interest groups.[15] Current information on disease distribution and knowledge of the mixing of birds in

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

migratory flyways has been used to develop a prioritized sampling approach based on the major North American flyways. Surveillance data from all of those areas would be incorporated into national risk assessments, preparedness, and response planning to reduce the adverse impacts of a disease outbreak in wild birds, poultry, or humans.

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

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

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

Surveillance in Hunter-harvested Birds: Check stations for waterfowl hunting or other harvestable bird species would provide an opportunity to sample dead birds to determine the presence of a disease, and supplement data collected during surveillance of live wild birds. Sampling of hunter-killed birds would focus on hunted species that are most likely to be exposed to a disease; have relatively direct migratory pathways from those areas to the United States; commingle in Alaska staging areas with species that could bring the virus from other parts of the world;

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

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

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

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

Under a technical assistance only alternative, WS would recommend an integrated approach similar to the proposed action alternative (Alternative 1); however, WS would not provide direct operational assistance under this alternative. Methods and techniques recommended would be based on WS' Decision Model using information provided from the requestor or from a site visit. In some instances, wildlife-related information provided to the requestor by WS could result in tolerance/acceptance of the situation. In other instances, damage management options would be discussed and recommended.

When damage management options were discussed, WS would recommend and demonstrate for use both non-lethal and lethal methods legally available for use to resolve bird damage. Those persons receiving technical assistance from WS could implement those methods recommended by WS, could employ other methods not recommended by WS, could seek assistance from other entities, or take no further action. However, those persons requesting assistance would likely be those people that would implement methods.

Despite no direct 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. Under this alternative, those persons experiencing threats or damage associated with birds in the State could lethally take birds. In order for the property owner or manager to use lethal methods, they must apply for their own depredation permit to take birds from the USFWS and the MDIFW, when required. Technical assistance could also be provided by WS as part of the application process for issuing a depredation permit by the USFWS under this alternative, when deemed appropriate. WS could evaluate the damage and complete a Migratory Bird Damage Report for the requester, which would include information on the extent of the damages, the number of birds present, and a recommendation for the number of birds that should be taken to best alleviate the damages. Following USFWS review of a complete application for a depredation permit from a property owner or manager and the Migratory Bird Damage Report, a depredation permit could be issued to authorize the lethal take of a specified number of each bird species.

Therefore, under this alternative, the number of birds lethally taken would likely be similar to the other alternatives. Take could be similar since take could occur through the issuance of a depredation permit, take could occur under depredation/control orders, take of non-native bird species could occur without the need for a permit, and take would continue to occur during the harvest season for certain species.

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 were concerned with threats posed by birds could seek assistance from other governmental agencies, private entities, or conduct damage management on their own. 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. Therefore, bird populations in the State would not be directly impacted by WS from a program implementing technical assistance only.

With the oversight of the USFWS and the MDIFW, 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 direct operational assistance could be provided by other entities, such as the MDIFW, the USFWS, private entities, and/or municipal authorities. If direct operational assistance was 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, FDA 2003).

Alternative 3 – No Bird Damage Management Conducted by WS

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

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

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

Under this alternative, property owners/managers may have difficulty obtaining permits to use lethal methods. The USFWS needs professional recommendations on individual damage situations before issuing a depredation permit for lethal take, and the USFWS does not have the mandate or the resources to conduct damage management activities. State agencies with responsibilities for migratory birds would likely have to provide this information if depredation permits were to be issued. If the information were provided to the USFWS, following the agency's review of a complete application package for a depredation permit from a property owner or manager to take birds lethally, the permit issuance procedures would follow that described in Alternative 1 and Alternative 2.

In some cases, control methods employed by property owners or managers could be contrary to the intended use of some of the methods or in excess of what is necessary. Inappropriate use of some non-lethal methods may result in injury to humans, damage to property and increased risk to non-target species. Those problems may occur because state agencies, businesses, and organizations have less technical knowledge and experience managing wildlife damage than WS.

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

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

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

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

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

Non-lethal methods have the potential to cause adverse effects to non-targets primarily through exclusion, harassment, and dispersal. Any exclusionary device erected to prevent access of target species also potentially excludes species that are not the primary reason the exclusion was erected; therefore, non-target species excluded from areas may potentially be adversely impacted if the area excluded is large enough. The use of auditory and visual dispersal methods used to reduce damage or threats caused by birds are also likely to disperse non-targets in the immediate area the methods are employed. Therefore, non-targets may be dispersed from an area while employing non-lethal dispersal techniques. However, like target species, the potential impacts on non-target species are expected to be temporary with target and non-target species often returning after the cessation of dispersal methods. Non-lethal methods would not be employed over large geographical areas or applied at such intensity that essential resources (*e.g*., food sources, habitat) would be unavailable for extended durations or over a wide geographical scope that long-term adverse effects would occur to a species' population. Non-lethal methods are generally regarded as having minimal impacts on overall populations of wildlife since individuals of those species are unharmed. The use of non-lethal methods would not have adverse impacts on non-target populations in the State under any of the alternatives.

Other non-lethal methods available for use under this alternative include live traps, nets, nest/egg destruction, translocation, and repellents. Live traps (*e.g*., cage traps, walk-in traps, decoy traps) and nets (*e.g*., cannon nets, mist nets, bow nets, dipping nets) restrain wildlife once captured and are considered live-capture methods. Live traps have the potential to capture non-target species. Trap and net placement in areas where target species are active and the use of target-specific attractants would likely minimize the capture of non-targets. If traps and nets were attended to appropriately, any non-targets captured can be released on site unharmed.

Nest destruction would not adversely affect non-target species since identification of the nests of target species would occur prior to efforts to destroy the nest. Nets could include the use of net guns, net launchers, cannon/rocket nets, drop nets, mist nets, bow nets, and dipping nets. Nets are virtually selective for target individuals since application would occur by attending personnel, with handling of wildlife occurring after deployment of the net or nets would be checked frequently to address any live-captured wildlife. Therefore, any non-targets captured using nets could be immediately released on site. Any potential non-targets captured using non-lethal methods would be handled in such a manner as to ensure the survivability of the animal if released. Even though live-capture does occur from those methods, the potential for death of a target or non-target animal while being restrained or released does exist, primarily from being struck by the cannon or rocket assemblies during deployment. The likelihood of non-targets being struck is extremely low and is based on being present when the net is activated and in a position to be struck. Nets are positioned to envelop wildlife upon deployment and to minimize striking hazards. Baiting of the areas to attract target species often occurs when using nets. Therefore, sites can be abandoned if non-target use of the area is high.

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

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

Two chemicals commonly registered with the EPA as bird repellents are methyl anthranilate and anthraquinone. Methyl anthranilate naturally occurs in grapes. Methyl anthranilate has been used to flavor food, candy, and soft drinks. Anthraquinone naturally occurs in plants, like aloe. Anthraquinone has been used to make dye. Both products claim to be unpalatable to many bird species. Several products are registered for use to reduce bird damage containing either methyl anthranilate or anthraquinone. Formulations containing those chemicals are liquids that are applied directly to susceptible resources. Methyl anthranilate applied to alleviate goose damage was effective for about four days depending on environmental conditions, which was a similar duration experienced when applying anthraquinone as geese continued to feed on treated areas (Cummings et al. 1995, Dolbeer et al. 1998). Dolbeer et al. (1998) found that geese tended to loaf on anthraquinone treated turf, albeit at lower abundance, but the quantity of feces on treated and untreated turf was the same, thus the risk of damage was unabated. Mesurol is applied directly inside eggs that are of a similar appearance to those being predated on by crows. Therefore, risks to non-target would be restricted to those wildlife species that would select for the egg baits. However, adherence to the label requirements of mesurol would ensure threats to non-targets would be minimal. Similarly, when used in accordance with the label requirements, the use of Avitrol would also not adversely affect non-targets based on restrictions on baiting locations.

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

Since products containing the active ingredient nicarbazin could be commercially available and purchased by people with a certified applicators license, the use of the product could occur under any of the alternatives discussed in the EA; therefore, the effects of the use would be similar across all the alternatives if the product were used according to label instructions. Under the proposed action, WS could use or recommend products containing nicarbazin as part of an integrated approach to managing damages associated with geese, domestic waterfowl, and pigeons, if products were registered for use in Maine. A product containing the active ingredient nicarbazin is currently registered in the State to manage local pigeon populations. Products containing nicarbazin are not currently registered in the State for use to manage local goose and domestic waterfowl populations. WS' use of nicarbazin under the proposed action would not be additive since the use of the product could occur from other sources, such as private pest management companies or those people experiencing damage could become a certified applicator and apply the bait themselves when the appropriate depredation permits were received[16].

Exposure of non-target wildlife to nicarbazin could occur from direct ingestion of the bait by non-target wildlife or from secondary hazards associated with wildlife consuming birds that have eaten treated bait. Several label restrictions of products containing nicarbazin are intended to reduce risks to non-target wildlife from direct consumption of treated bait (EPA 2005). The labels require an acclimation period that habituates target birds to feeding in one location at a certain time. During baiting periods, the applicator must be present on site until all bait has been consumed. Non-target risks can be further minimized by requirements on where treated baits can be placed. All unconsumed bait must also be retrieved daily, which further reduces threats of non-targets consuming treated bait.

In addition, nicarbazin is only effective in reducing the hatch of eggs when blood levels of 4,4'-dinitrocarbanilide (DNC) are sufficiently elevated in a bird species. When consumed by birds, nicarbazin is broken down into the two base components of DNC and 4,4'-dinitrocarbanilide (HDP), which are then rapidly excreted. To maintain the high blood levels required to reduce egg hatch, birds must consume nicarbazin daily at a sufficient dosage that appears to be variable depending on the bird species (Yoder et al. 2005, Avery et al. 2006). For example, to reduce egg hatch in Canada geese, geese must consume nicarbazin at 2,500 ppm compared to 5,000 ppm required to reduce egg hatch in pigeons (Avery et al. 2006, Avery et al. 2008). In pigeons, consuming nicarbazin at a rate that would reduce egg hatch in Canada geese did not reduce the hatchability of eggs in pigeons (Avery et al. 2006). With the rapid excretion of the two components of nicarbazin (DNC and HDP) in birds, non-targets birds would have to consume nicarbazin daily at sufficient doses to reduce the rate of egg hatching.

Secondary hazards also exist from wildlife consuming geese, domestic waterfowl, or pigeons that have ingested nicarbazin. As mentioned previously, once consumed, nicarbazin is rapidly broken down into the two base components DNC and HDP. DNC is the component of nicarbazin that limits egg hatchability while HDP only aids in absorption of DNC into the bloodstream. DNC is not readily absorbed into the bloodstream and requires the presence of HDP to aid in absorption of appropriate levels of DNC. Therefore, to pose a secondary hazard to wildlife, ingestion of both DNC and HDP from the carcass would have to occur and HDP would have to be consumed at a level to allow for absorption of the DNC into the bloodstream. In addition, an appropriate level of DNC and HDP would have to be consumed from a carcass daily to produce any negative reproductive affects to other wildlife since current

[16]A depredation permit would only be required when managing localized Canada goose populations. A depredation permit would not be required to manage pigeon or domestic waterfowl populations.

evidence indicates a single dose does not limit reproduction. To be effective, nicarbazin (both DNC and HDP) must be consumed daily during the duration of the reproductive season to limit the hatchability of eggs. Therefore, to experience the reproductive affects of nicarbazin, geese, domestic waterfowl, or pigeons that had consumed nicarbazin would have to be consumed by a non-target species daily and a high enough level of DNC and HDP would have to be available in the carcass and consumed for reproduction to be affected. Based on the risks and likelihood of wildlife consuming a treated carcass daily and receiving the appropriate levels of DNC and HDP daily to negatively impact reproduction, secondary hazards to wildlife from the use of nicarbazin are extremely low (EPA 2005).

Although some risks to other non-target species besides bird species does occur from the use of products containing nicarbazin, those risks would likely be minimal given the restrictions on where and how bait can be applied. Although limited toxicological information for nicarbazin exists for wildlife species besides certain bird species, available toxicology data indicates nicarbazin is relatively non-toxic to other wildlife species (World Health Organization 1998, EPA 2005, California Department of Pesticide Regulation 2007). Given the use restriction of nicarbazin products and the limited locations where bait can be applied, the risks of exposure to non-targets would be extremely low.

Impacts to non-targets from the use of non-lethal methods would be similar to the use of non-lethal methods under any of the alternatives. Non-targets would generally be unharmed from the use of non-lethal methods under any of the alternatives since no lethal take would occur. Non-lethal methods would be available under all the alternatives analyzed. WS' involvement in the use of or recommendation of non-lethal methods would ensure non-target impacts are considered under WS' Decision Model. Impacts to non-targets under this alternative from the use of and/or the recommendation of non-lethal methods are likely to be low.

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

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

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

Once sites were baited, sites would be monitored daily to observe for non-target feeding activity. If non-target were observed feeding on bait, those sites would be abandoned. By acclimating target bird species to a feeding schedule, baiting could occur at specific times to ensure bait placed would be quickly consumed by target bird species, especially when large flocks of target species were present. The acclimation period would allow treated bait to be present only when birds were conditioned to be present at the site. An acclimation period would also increase the likelihood that treated bait was consumed by the target species, which would make it unavailable to non-targets. In addition, when present in large numbers, many bird species 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 would only occur when treated bait was present at a bait location. WS would retrieve all dead birds to the extent possible, following treatment with DRC-1339 to minimize secondary hazards associated with scavengers feeding on bird carcasses.

DRC-1339 Primary Hazard Profile - DRC-1339 was selected for reducing bird damage because of its high toxicity to blackbirds (DeCino et al. 1966, West et al. 1967, Schafer, Jr. 1972) and low toxicity to most mammals, sparrows, and finches (Schafer, Jr. and Cunningham 1966, Apostolou 1969, Schafer, Jr. 1972, Schafer, Jr. et al. 1977, Matteson 1978, Cunningham et al. 1979, Cummings et al. 1992, Sterner et al. 1992). The likelihood of a non-target bird obtaining a lethal dose is dependent on: (1) frequency of encountering the bait, (2) length of feeding bout, (3) the bait dilution rate, (4) the bird's propensity to select against the treated bait, and (5) the susceptibility of the non-target species to the toxicant. Birds that ingest DRC-1339 probably die because of irreversible necrosis of the kidney and subsequent inability to excrete uric acid (*i.e.*, uremic poisoning) (DeCino et al. 1966, Felsenstein et al. 1974, Knittle et al. 1990). Birds ingesting a lethal dose of DRC-1339 usually die in one to three days.

The median acute lethal dose (LD_{50})[17] values for starlings, blackbirds, and magpies (Corvidae) range from one to five mg/kg (Eisemann et al. 2003). For American crows, the median acute lethal dose has been estimated at 1.33 mg/kg (DeCino et al. 1966). The acute oral toxicity (LD_{50}) of DRC-1339 has been estimated for over 55 species of birds (Eisemann et al. 2003). DRC-1339 is toxic to mourning doves, pigeons, quail (*Coturnix coturnix*), chickens, and ducks (*Anas* spp.) at ≥5.6 mg/kg (DeCino et al. 1966). In cage trials, Cummings et al. (1992) found that 2% DRC-1339-treated rice did not kill savannah sparrows (*Passerculus sandwichensis*). Gallinaceous birds and waterfowl may be more resistant to DRC-1339 than blackbirds, and their large size may reduce the chances of ingesting a lethal dose (DeCino et al. 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*b*).

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

Based on those concerns, the Ecological Committee on FIFRA Risk Assessment was established by the EPA to provide guidance on ecological risk assessment methods (EPA 1999). The committee report

[17] 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.

recommended to the EPA that only one definitive LD_{50} be used in toxicity screening either on the mallard or northern bobwhite and recommended further testing be conducted using the up-and-down method (EPA 1999). Many of the screening methods used for DRC-1339 prior to the establishment of EPA guidelines in 1982 used the up-and-down method of screening (Eisemann et al. 2003).

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

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

DRC-1339 is rapidly metabolized and excreted and does not bioaccumulate, which probably accounts for its low secondary hazard profile (Schafer, Jr. 1991). For example, cats, owls, and magpies would be at risk only after exclusively eating DRC-1339-poisoned starlings for 30 continuous days (Cunningham et al. 1979). According to the EPA (1995), laboratory studies with raptors indicated no adverse effects when certain raptor species were fed starlings poisoned with 1% DRC-1339 treated baits. Two American kestrels survived eating 11 and 60 poisoned starlings over 24 and 141 days, respectively. Two Cooper's hawks ate 191 and 222 starlings with no observable adverse effects. Three northern harriers ate 100, 191, and 222 starlings over 75 to 104 days and survived with no apparent detrimental effects. The LD_{50} values established for other avian predators and scavengers, such as crows, ravens, and owls indicate these species are acutely more sensitive to DRC-1339 than hawks and kestrels (EPA 1995). 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 around sites baited with DRC-1339. Smith (1999) did not find carcasses of non-targets that exhibited histological signs consistent with DRC-1339 poisoning. 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; therefore, DRC-1339 degrades rapidly when exposed to sunlight, heat, or ultra violet radiation and has a half-life of less than two days (EPA 1995). 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.

Additional concerns have been raised regarding the risks to non-target wildlife associated with crows caching bait treated with DRC-1339. Crows are known to cache surplus food usually by making a small hole in the soil using the bill, by pushing the food item under the substrate, or covering items with debris

(Verbeek and Caffrey 2002). Distances traveled from where the food items were gathered to where the item is cached varies, but some studies suggest crows can travel from 100 meters (Kilham 1989) 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 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; thus, 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. Treated bait would be mixed with untreated bait before baiting an area. Mixing treated bait with untreated bait would minimize non-target hazards and reduce the likelihood of the 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.

While every precaution would be 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 would be 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 Maine is expected to be extremely low to non-existent. Non-targets have not been lethally taken by WS during prior activities targeting birds in the State. WS would monitor the take of non-target species to ensure program activities or methodologies used in bird damage management do not adversely affect non-targets. Methods available to resolve and prevent bird damage or threats when employed by trained, knowledgeable personnel are selective for target species. WS would annually report to the USFWS and/or the MDIFW 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 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 crows will force other species from those prime-nesting areas. American crows often feed on the eggs, nestlings, and fledglings of other bird species. 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 other measures. SOPs to avoid T&E effects are described in Chapter 3 of this EA.

Federally Listed Species **-** The current list of species designated as threatened and endangered in Maine 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 along with common and scientific names.

Based on a review of those T&E species listed in the State during the development of the EA (see Appendix C), WS has determined that activities conducted pursuant to the proposed action would have no effect on those species listed in the State by the USFWS and the National Marine Fisheries Services nor their critical habitats.

State Listed Species – The current list of State listed species as endangered or threatened by the State as determined by the MDIFW was obtained and reviewed during the development of the EA (see Appendix D). Based on the review of species listed in the State, WS has determined that the proposed activities would have no effect on those species currently listed by the State.

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 people 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 only methods that would not be available under a technical assistance only alternative would include DRC-1339, alpha-chloralose, and mesurol, which would only be available for use by WS' employees.

The potential impacts to non-targets under this alternative would be variable and based on several factors. If methods were employed, as recommended by WS, the potential impacts to non-targets would likely be 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 impacts on 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 would occur when employing shooting as a method and if persons were familiar with the identifying characteristics of the target bird species, the potential impacts to non-target species would likely be low under this alternative.

Those people experiencing damage from birds may implement methods and techniques based on the recommendations of WS. The potential for impacts would be based on the knowledge and skill of those persons implementing recommended methods. Potential impacts from providing only technical assistance could be greater than those described in the proposed action if those people experiencing damage do not implement methods or techniques correctly. Methods or techniques recommended by WS that were implemented incorrectly could lead to an increase in non-target take.

If requestors were provided technical assistance but do not implement any of the recommended actions and take other actions, the potential impacts to non-targets could be higher compared to the proposed action. If those people 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 that were not implemented as recommended or were 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. It is possible that frustration caused by the inability to reduce damage and associated losses could lead to illegal killing of birds, which could lead to unknown effects on local non-target species populations, including some T&E species. When those people 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 (*e.g*., see White et al. 1989, USFWS 2001, FDA 2003). The use of illegal toxicants by those persons 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.

Those persons requesting assistance would likely be those people who would use lethal methods since a damage threshold had been met for that individual requestor that triggered seeking assistance to reduce damage. The potential impacts on non-targets by those persons experiencing damage would be highly variable. People whose bird damage problems were not effectively alleviated by non-lethal control methods could 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.

The ability to reduce negative impacts caused by birds to wildlife species and their habitats, including T&E species, would be variable based upon the skills and abilities of the person implementing damage management actions. 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.

Alternative 3 – No Bird Damage Management Conducted by WS

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

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

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

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

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

Under the proposed action, those methods discussed in Appendix B, would be integrated to resolve and prevent damage associated with birds in the State. WS would use the Decision Model to determine the appropriate method or methods that would effectively resolve the request for assistance. The cooperator requesting assistance would be 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. Therefore, the cooperator would be made aware of the use of those methods on property they own or manage prior to the initiation of any project, which would assist with identifying any risks to human safety associated with the use of those methods. 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. WS would continue to provide technical assistance and/or direct operational assistance to those persons seeking assistance with managing damage or threats from birds. 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 could be employed as part of direct operational assistance by WS would be similar to those risks addressed in the other alternatives. Although hazards to human safety from non-lethal methods exist, those methods would generally be regarded as safe when used by trained individuals who were experienced in their use. Although some risk of fire and bodily harm would exist from the use of pyrotechnics, lasers, and propane cannons, when used appropriately and in consideration of those risks, those methods can be used with a high degree of safety.

Lethal methods available under the proposed action would include the use of firearms, DRC-1339, live-capture followed by euthanasia, and the recommendation that birds be harvested during the regulated hunting season established for those species by the USFWS and the MDIFW. Those lethal methods available under the proposed action alternative or similar products would also be available under the other alternatives. Although the avicide DRC-1339 would be restricted to use by WS only, a similar product containing the same active ingredient as DRC-1339 could be made available for use as a restricted use pesticide by other entities. However, at the time this EA was developed, the commercially available product containing the same active ingredient as DRC-1339 for use to manage damage associated with blackbirds and starlings at livestock and poultry operations was not registered for use in the State.

WS' employees who conduct activities would be knowledgeable in the use of methods, wildlife species responsible for causing damage or threats, and WS' directives. That knowledge would be incorporated into the decision-making process inherent with the WS' Decision Model that would be applied when addressing threats and damage caused by birds. Prior to and during the utilization of methods, WS' employees would consider risks to human safety based on location and method. Risks to human safety from the use of methods would likely be greater in urban areas when compared to rural areas that were less densely populated. Consideration would also be given to the location where damage management activities would be conducted based on property ownership. If locations where methods would be employed occurred on private property in rural areas where access to the property was controlled and monitored, the risks to human safety from the use of methods would likely be less. If damage management activities occurred at or near public use areas, then risks of the public encountering damage management methods and the corresponding risk to human safety would increase. Activities would generally be conducted when human activity was minimal (*e.g*., early mornings, at night) or in areas where human activities was minimal (*e.g*., in areas closed to the public).

The use of live-capture traps has also been identified as a potential issue. Live-capture traps would typically be set in situations where human activity was minimal to ensure public safety. Traps rarely cause serious injury and would only be triggered through direct activation of the device. 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. If left undisturbed, risks to human safety would be minimal.

Other live-capture devices, such as cannon nets, 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. Personnel employing nets would be present at the site during application to ensure the safety of the public and operators. Although some fire and explosive hazards exist with rocket nets during ignition and storage of the explosive charges, safety precautions associated with the use of the method, when adhered to, pose minimal risks to human safety and primarily occur to the handler. Nets would not be employed in areas where public activity was high, which further reduces the risks to the public. Nets would be employed in areas where public access was restricted whenever possible to reduce risks to human safety. Overall, nets would pose minimal risks to the public. Lasers would also pose minimal risks to the public since application would occur directly to target species by trained personnel, which would limit the exposure of the public to misuse of the method.

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

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

The recommendation of repellents or the use of those repellents registered for use to disperse birds in the State 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 directly used by WS under this alternative would also be available under any of the alternatives. Therefore, risks to human safety from the recommendation of repellents or the direct use of repellents would be similar across all the alternatives. Risks to human safety associated with the use or recommendation of repellents were addressed under the technical assistance only alternative (Alternative 2) and would be similar across all the alternatives. WS' involvement, either through recommending the use of repellents or the direct use of repellents, would ensure that label requirements of those repellents are discussed with those persons requesting assistance when recommended through technical assistance or would be specifically adhered to by WS' personnel when using those chemical methods. Therefore, the risks to human safety associated with the recommendation of or direct use of repellents could be lessened through WS' participation.

Mesurol contains the active ingredient methiocarb and is registered by the EPA for use to condition crows not to feed on the eggs of T&E species. Mesurol is currently not registered for this purpose in Maine but will be evaluated in this assessment as a repellent that could be employed under the proposed action if the product becomes available. Mesurol is mixed with water and once mixed, placed inside raw eggs that are similar in size and appearance to the eggs of the species being protected. Treated eggs are placed in the area where the protected species are known to nest at least three weeks prior to the onset of egg-laying to condition crows to avoid feeding on eggs. Methiocarb is a carbamate pesticide that acts as a cholinesterase inhibitor. Crows ingesting treated eggs become sick (*e.g.*, regurgitate, become lethargic), but recover. Human safety risks associated with the use of mesurol occur primarily to the mixer and handler during preparation. WS' personnel would follow all label requirements, including the personal protective equipment required to handle and mix bait. When used according to label requirements, the risks to human safety from the use of mesurol would be minimal.

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

Factors that minimize any risk of public health problems from the use of DRC-1339 are: 1) its use is prohibited within 50 feet of standing water and cannot be applied directly to food or feed crops (contrary to some misconceptions, DRC-1339 is not applied to feed materials that livestock can feed upon), 2) DRC-1339 is highly unstable and degrades rapidly when exposed to sunlight, heat, or ultraviolet radiation. The half-life is about 25 hours; in general, DRC-1339 on treated bait material is almost completely broken down within a week if not consumed or retrieved, 3) the chemical is more than 90% metabolized in target birds within the first few hours after they consume the bait. Therefore, little material is left in bird carcasses that may be found or retrieved by people, 4) application rates are extremely low (EPA 1995), 5) a human would need to ingest the internal organs of birds found dead from DRC-1339 to be exposed, and 6) the EPA has concluded that, based on mutagenicity (*i.e.*, 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 in the State during 2011 occurred as a split season, from late January to the end of March, and August through September with no daily take limit and no possession limit (MDIFW 2013*b*). 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 of the State during those periods, most requests for assistance to manage crow damage during the period of time when crows can be harvested in the State 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.

When managing damage associated with urban crow roosts, the use of DRC-1339 would likely occur at known forage areas (where crows from a roost location are known to travel to) or could occur near the roost location where crows have been conditioned to feed using prebaiting. Crows, like other blackbirds, often stage (congregate) in an area prior to entering a roost location. The staging behavior often exhibited by blackbirds occurs consistently and this behavior can be induced to occur consistently at a particular location using prebaiting since blackbirds often feed prior to entering a roost location. Prebaiting can also induce feeding at a specific location as crows exit a roost location in the morning by providing a consistent food source. Baiting with DRC-1339 treated baits most often occurs during the winter when the availability of food is limited and crows can be conditioned to feed consistently at a location by providing a consistent source of food. Given the range in which the death of sensitive bird species occurs, crows that consume treated bait could fly long distances. Although not specifically known for crows, sensitive bird species that ingest a lethal dose of DRC-1339 treated bait generally die within 24 to 72 hours after ingestion (USDA 2001*b*). Therefore, crows that ingest a lethal dose of DRC-1339 at the bait site could die in other areas besides the roost location or the bait site.

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

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

As stated previously, to pose risks to human safety, a hunter would have to harvest a crow that has ingested DRC-1339 and then, ingest tissue of the crow that contains residue. Very little information is available on the acute or chronic toxicity of DRC-1339 on people. However, based on the information available, risks to human safety would be extremely low based on several factors. First, a hunter would have to harvest a crow that had ingested DRC-1339. As stated previously, the use of DRC-1339 primarily occurs to address damage associated with urban roosts. Hunting and discharging a firearm is prohibited in most municipal areas. Therefore, a crow would have to ingest treated bait and then travel to an area (typically outside of the city limit) where hunting was allowed. WS would not recommend hunting as a damage management tool in those general areas where DRC-1339 was actively being applied. Secondly, to pose a risk to human safety the crow would have to be consumed and the tissue consumed would have to contain residues. Thirdly, the tissue consumed would have to contain chemical residues of DRC-1339.

Current information indicates that the majority of the chemical is excreted within a few hours of ingestion. The highest concentration of the chemical occurs in the gastrointestinal tract of the bird, which is discarded and not consumed. Although residues have been detected in the tissues that might be consumed (*e.g.*, breast meat) in some bird species that have consumed DRC-1339, residues appear to only be detectable when the bird has consumed a high dose of the chemical that far exceeds the LD_{50} for that species and would not be achievable under normal baiting procedures. Although no information is currently available on the number of people that might consume crows in Maine, very few, if any, people are likely consuming crows harvested in Maine or elsewhere. Crows are primarily harvested for recreational purposes and are removed to alleviate damage in the State; therefore, crows are not harvested for subsistence.

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

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

Threats to human safety from the use of nicarbazin would likely be minimal if labeled directions were followed. The use pattern of nicarbazin would also ensure threats to public safety were minimal. The label requires an acclimation period before placing treated bait, which assists with identifying risks, requires the presence of the applicator at the location until all bait was consumed, and requires any unconsumed bait be retrieved. The EPA has characterized nicarbazin as a moderate eye irritant. The FDA has established a tolerance of nicarbazin residues of 4 parts per million allowed in uncooked chicken muscle, skin, liver, and kidney (see 21 CFR 556.445). The EPA characterized the risks of human exposure as low when used to reduce egg hatch in Canada geese. The EPA also concluded that if human consumption occurred, a prohibitively large amount of nicarbazin would have to be consumed to produce toxic effects (EPA 2005). Based on the use pattern of the nicarbazin and if label instructions were followed, risks to human safety would be low with the primary exposure occurring to those handling and applying the product. Safety procedures required by the label, when followed, would minimize risks to handlers and applicators.

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

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

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

The recommendation by WS that birds be harvested during the regulated hunting season, which would be established by the MDIFW 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 MDIFW for the regulated hunting season would further minimize risks associated with hunting. Although hunting accidents do occur, the recommendation of allowing hunting to reduce localized populations of birds would not increase those risks.

No adverse effects to human safety have occurred from WS' use of methods to alleviate bird damage in the State from FY 2006 through FY 2011. The risks to human safety from the use of non-lethal and lethal methods, when used appropriately and by trained personnel, would be considered low.

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 people requesting assistance with bird damage and threats. The only methods that would not be available under this alternative would be mesurol, alpha chloralose, and DRC-1339. 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.

The use of chemical methods that are considered non-lethal would also be available under this alternative. Chemical methods available would include repellents. 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. Repellents that require ingestion are intended to discourage foraging on vulnerable resources and to disperse birds from areas where the repellents are applied. The active ingredients of repellents that are currently registered for use to disperse birds include methyl anthranilate and polybutene. Another common active ingredient in repellents intended to disperse other bird species contain the active ingredient anthraquinone. Currently, no repellents are registered for use to disperse birds in the State that contain the active ingredient anthraquinone. 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 by WS that birds be harvested during the regulated hunting season, which is established by the MDIFW, would not increase risks to human safety above those risks already inherent with hunting birds. Recommendations of allowing hunting on property owned or managed by a cooperator to reduce bird populations, which could then reduce bird damage or threats would not increase risks to human safety. Safety requirements established by the MDIFW for the regulated hunting season would further minimize risks associated with hunting. Although hunting accidents do occur, the recommendation of allowing hunting to reduce localized bird populations would not increase those risks.

The recommendation of shooting with firearms either as a method of direct lethal take could occur under this alternative. Safety issues can 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 were 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.

If non-chemical methods were employed according to recommendations and as demonstrated by WS, the potential risks to human safety would be similar to the proposed action. If methods were 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 would also be made aware of threats to human safety associated with the use of those methods. SOPs for methods are discussed in Chapter 3 of this EA. 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.

Alternative 3 – No Bird Damage Management Conducted by WS

Under the no involvement by WS 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. Many of the methods discussed in Appendix B would be available to those persons experiencing damage or threats and could be used to take birds if permitted by the USFWS and/or the MDIFW. The direct burden of implementing permitted methods would be placed on those experiencing damage.

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

Similar to the technical assistance only alternative, DRC-1339, mesurol, and alpha chloralose would not be available under this alternative to those people experiencing damage or threats from birds. Chemical methods that would be available to the public would include repellents and if a person obtained the appropriate restricted use pesticide license, a product with the same active ingredient as DRC-1339, if registered in the State, could be applied. 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 people not experienced in the use of methods or are not trained in their proper use, could increase threats to human safety. Overall, the methods available to the public, when applied correctly and appropriately, pose minimal risks to human safety.

Issue 4 - Effectiveness of Damage Management Methods

A common issue when addressing wildlife damage is the effectiveness of the methods being employed to resolve the damage. When those persons experiencing wildlife damage request assistance from other entities, the damage occurring has likely reached or would reach an economic threshold that is unacceptable to those persons requesting assistance. Therefore, methods being employed to resolve damage must be effective at resolving damage or threats within a reasonable amount of time to prevent further economic loss. The issue of method effectiveness as it relates to each alternative analyzed in detail is discussed below.

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

Under the proposed action, WS would continue the use of an adaptive approach using an integration of methods to resolve bird damage. WS would continue to provide both technical assistance and direct operational assistance to those people requesting assistance. WS would only provide assistance after a request had been received and a cooperative service agreement or other comparable document had been signed by WS and the requesting entity. The document signed between WS and the requesting entity would indicate those methods agreed upon to address birds causing damage. Methods employed to manage bird damage, whether non-lethal or lethal, are often temporary with the duration dependent on many factors, including bird densities in the area, the availability of suitable habitat in the area, and the availability of methods. WS would employ only those methods as agreed upon by the requestor after available methods were discussed.

A common issue raised is the use of lethal methods are ineffective because additional birds would likely return to the area, either after removal occurred or the following year when birds returned to the area to nest, which gives the impression of creating a financial incentive to continue the use of only lethal methods. This assumes birds only return to an area where damage was occurring if lethal methods are used. However, the use of non-lethal methods is also often temporary, which could result in birds returning to an area where damage was occurring once those methods were no longer used. The common factor when employing any method is that birds would return if suitable habitat continued to exist at the location where damage was occurring and bird densities were sufficient to occupy all available habitats. Therefore, any reduction or prevention of damage from the use of methods addressed in Appendix B would be temporary if habitat conditions continue to exist that attract birds to an area where damage occurs.

Dispersing birds using pyrotechnics, effigies, aversive noise, repellents, border collies, or any other non-lethal method addressed in Appendix B often requires repeated application to disperse birds, which can increase costs, move birds to other areas where they could cause damage, and would often be temporary if habitat conditions remained unchanged. Dispersing and the translocating 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. WS' recommendation of or use of techniques to modifying existing habitat or making areas unattractive to birds is discussed in Appendix B. WS' objective would be 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 adapt methods in an integrated approach to managing bird damage that is agreed upon by the cooperator.

As part of an integrated approach to managing bird damage, WS would have the ability to adapt methods to damage situations to effectively reduce or prevent damage from occurring. Under the proposed integrated approach, all methods, individually or in combination, could be employed as deemed appropriate through WS' Decision Model to address requests for assistance. WS' objective when receiving a request for assistance under the proposed action is to reduce damage and threats to human safety or to prevent damage from occurring using an integrated approach to managing bird damage. Therefore, under the proposed action, WS would employ methods adaptively to achieve that objective.

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

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. The USFWS has evaluated and implemented long-term approaches to managing resident Canada goose populations with the intent of reducing damage associated with geese (USFWS 2005). Dispersing birds is often a short-term solution that moves 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). For example, 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. For example, during a six-year project using only non-lethal methods to disperse crows in New York, the number of events required to disperse crows remained similar amongst years and at some locations, the number of events required to harass crows increased from the start of the project (Chipman et al. 2008).

The use of only non-lethal methods to alleviate damage involving other bird species has had similar results requiring constant application and re-application. Recent research has indicated that non-lethal harassment programs can reduce bird numbers at specific sites, but those programs do little to reduce the overall population of nuisance birds locally and may shift the problem elsewhere. Preusser et al. (2008) found that 12 of 59 geese banded at a study site in Orange County, New York that were hazed regularly were observed at an unmanaged location 1.2 km away on 161 occasions during 2004. This is similar to findings by Holevinski et al. (2007) who documented hazed radio-marked geese moved an average of 1.18 km at an urban site in Brighton, New York. Cooper and Keefe (1997) found that fencing and harassment with dogs were the only effective short-term approaches to reducing goose damage but likely redistribute the problem elsewhere.

Long-term solutions to resolving bird damage often require management of the population (Smith et al. 1999) and identifying the habitat characteristics that attract birds to a particular location (Gorenzel and Salmon 1995). For example, hunting, goose removal, and egg destruction were identified as long-term solutions to resolving goose damage over larger geographical areas by reducing goose populations (Cooper and Keefe 1997). Boyd and Hall (1987) showed that a 25% reduction in a local crow roost resulted in reduced hazards to a nearby airport. Cooper (1991) reported the removal of geese posing or likely to pose a hazard to air safety at airports considerably reduced the population of local geese, decreased the number of goose flights through airport operations airspace, and reduced goose-aircraft collisions at Minneapolis-St. Paul International Airport. An integrated approach to resolving goose damage is likely the most effective (Smith et al. 1999). In addition, Dolbeer et al. (1993*a*) demonstrated that an integrated approach (including removal of offending birds) reduced bird hazards at airports and substantially reduced bird collisions with aircraft by as much as 89%. Jensen (1996) also reported that an integrated approach that incorporated the removal of geese, reduced goose-aircraft collisions by 80% during a two year period. Translocating geese to areas where they can be hunted has been found to be an effective method to reduce conflicts with geese at problem sites. Hall and Groniger (2002) found that translocated geese were subject to higher hunting mortality by about 8% than non-relocated geese and that hunting as a management tool reduced the population of geese at Truckee Meadows in Nevada from about 2,000 to 400 geese. Holevinski et al. (2006) found that more translocated adult geese (23.8%) and juvenile geese (22.0%) in New York were harvested than control geese when translocated to an area open to hunting; and that only seven of 177 translocated geese returned to the original capture site. Recent research at an airport in the United Kingdom found that through the capture of approximately 287 geese each year over a period of three years, combined with the oiling of 2,980 eggs and hazing geese from problem roost sites, reduced goose movements over the airfield by 63% (Baxter and Robinson 2007).

Often of concern with the use of lethal methods is that birds that are lethally taken would only be replaced by other birds either during the application of those methods (*e.g.*, from other birds that immigrate into the area) or by birds the following year (*e.g.*, increase in reproduction and survival that could result from less competition). As stated previously, the use of lethal methods to manage localized damage is not intended as a way to manage bird populations 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. The intent of employing lethal methods is to target those birds causing damage and not to manage entire bird populations; therefore, those lethal methods can be effective despite birds returning the following year.

As stated previously, Chipman et al. (2008) found that crows returned to roosts previously dispersed using non-lethal methods within 2 to 8 weeks. In addition, Chipman et al. (2008) found that the use of non-lethal methods had to be re-applied every year during a six-year project evaluating the use of only non-lethal methods. At some roost locations, Chipman et al. (2008) found the number of crows that returned each year to roosts over a six-year period actually increased despite the use of non-lethal methods each year. Despite the need to re-apply non-lethal methods yearly, the return of birds to roost locations previously dispersed, and the number of crows using roost locations increasing annually at some roost locations, Chipman et al. (2008) determined the use of non-lethal methods could be effective at dispersing urban crow roosts in New York. Similar results were found by Avery et al. (2008) during the use of crow effigies and other non-lethal methods to disperse urban crow roosts in Pennsylvania. Crows returned to roost locations in Pennsylvania annually despite the use of non-lethal methods and effigies (Avery et al. 2008). Gorenzel et al. (2002) found that crows returned to roost locations after the use of lasers. Therefore, the use of both lethal and non-lethal methods may require repeated use of those methods. The return of birds to areas where damage management methods were previously employed does not indicated previous use of those methods were ineffective since the intent of those methods are to reduce the number of birds present at a site where damage is occurring at the time those methods are employed.

Another concern when employing methods to resolve bird damage associated with bird roosts is the apparent success of methods being claimed when birds actually have dispersed from an area naturally. This could apply to both lethal and non-lethal methods. Bird migration periods vary during the spring and fall depending on the geographical region and other natural stimuli (Verbeek and Caffrey 2002). For example, many of the studies evaluating methodologies for alleviating crow damage occurred during periods of time when crows could have been dispersing naturally, which must be considered when evaluating the success of methods in reducing damage. Boyd and Hall (1987) determined a reduction of the number of crows in roost by 25% using DRC-1339 could reduce damage occurring from crows using local roosts in Arkansas and Kentucky. However, work conducted using DRC-1339 occurring in January and February when roosts could have been breaking up naturally, as crows disperse to breeding areas. Chipman et al. (2008) found the use of non-lethal methods could be effective in dispersing urban crow roosts in New York. However, hazing projects did not occur until after pre-treatment assessments of crow roosts were conducted from November through January during the six-year project (Chipman et al. 2008). Thus, similar to the work conducted by Boyd and Hall (1987), those non-lethal methods employed by Chipman et al. (2008) in New York occurred in January and could have occurred during the period of time when crows begin to disperse naturally. Avery et al. (2008) noted that the use of effigies and other non-lethal methods at crow roosts in Pennsylvania during December 2005 were successful in breaking up the large roost into smaller roosts but the roosts did not begin to disperse until January. Therefore, to evaluate effectively the future use of methods, in bird damage management activities, WS would consider the time of year those methods were employed in relationship to when birds may have dispersed naturally.

Based on the evaluation of the damage situation, the most effective methods would be employed individually or in combination based on the prior evaluations of methods or combinations of methods in other damage management situations using the WS Decision Model. Once employed, methods would be further evaluated for effectiveness based on a continuous evaluation of activities by WS. Therefore, the effectiveness of methods would be 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.

Population limiting techniques (*e.g*., hunting, capture and euthanize, shooting, and nest/egg destruction) may have long-term effects and can slow population growth or even reduce the size of a bird population (Cooper and Keefe 1997). This alternative would give WS the option to implement lethal management in response to human health and safety concerns and damage to property and other resources. This alternative would enhance WS' effectiveness and ability to address a broader range of damage problems.

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

With WS providing technical assistance but no direct management assistance under this alternative, entities requesting assistance could either take no action, which means conflicts and damage would likely continue or increase in each situation as bird numbers are maintained or increased, or implement WS' recommendations for non-lethal and lethal control methods. Methods of frightening or dispersing birds have been effective at specific sites. However, in most instances, those methods have simply shifted the problem elsewhere (Conover 1984, Aguilera et al. 1991, Swift 1998). Of the non-lethal techniques commonly used by the public to reduce conflicts with birds (*e.g.*, feeding ban, habitat modification, methyl anthranilate, fencing, harassment using dogs, people, or vehicles), only fencing was reported to have been highly effective (Cooper and Keefe 1997). Habitat modifications, while potentially effective, are poorly accepted, not widely employed, and many are not biologically sound (*e.g.*, draining or reducing water levels in wetlands). Long-term solutions usually require some form of local population reduction to stabilize or reduce bird population size (*e.g.*, see Smith et al. 1999). Population reduction would be limited to applicable state and federal laws and regulations authorizing take of birds, including legal hunting and take pursuant to depredation permits. However, individuals or entities that implement management may not have the experience necessary to conduct the actions efficiently and effectively.

Under this alternative, most of the methods described in Appendix B would be recommended and/or demonstrated, except for alpha chloralose, mesurol, and DRC-1339. WS would recommend methods using the WS Decision Model based on information provided by those people requesting assistance or through site visits. WS would describe and demonstrate the correct application of those lethal and non-lethal methods available. If those persons receiving technical assistance apply methods as recommended and demonstrated by WS, those methods when employed to resolve bird damage are reasonably anticipated to be effective in resolving damage occurring. Under this alternative, those people requesting assistance would be provided information on bird behavior to ensure methods were applied when the use of those methods would likely be most effective.

The effectiveness of methods under this alternative would be similar to the other alternatives since many of the same methods would be available, except alpha chloralose, mesurol, and DRC-1339. If methods were employed as intended and with regard to the behavior of the bird species causing damage, those methods are likely to be effective in resolving damage. The demonstration of methods and the information provided on bird behavior provided by WS through technical assistance under this alternative would likely increase the effectiveness of the methods employed by those people requesting assistance. However, if methods are employed that are not recommended or if those methods are employed incorrectly by those people requesting assistance, methods could be less effective in resolving damage or threats.

Alternative 3 – No Bird Damage Management Conducted by WS

The methods available to those people experiencing damage under this alternative would be similar to those methods that would be available under the other alternatives. The only method that would not be available under this alternative would be the use of alpha chloralose, mesurol, and DRC-1339, which are restricted to use by WS only. WS would not be directly involved with application of any methods to resolve damage caused by birds in Maine under this alternative. The recommendation of methods and the use of methods would be the responsibility of other entities and/or those persons experiencing damage. When available methods are employed as intended, a reasonable amount of effectiveness is expected. If methods are employed incorrectly due to a lack of knowledge of the correct use of those methods or if methods are employed without consideration of the behavior of birds causing damage, those methods being employed are likely to be less effective.

Since those methods available for resolving bird damage would be available to those persons experiencing damage or threats, the effectiveness of those methods when used as intended would be similar among the alternatives. Those non-lethal methods discussed in Appendix B would be available to those persons experiencing bird damage despite WS' lack of involvement under this alternative. The use of lethal methods under this alternative would continue to be available, as permitted by the USFWS and the MDIFW. Nest destruction and egg oiling/addling would continue to occur under this alternative when permitted by the USFWS and the MDIFW. Since WS would not be involved with any aspect of bird damage management under this alternative, the use of methods and the proper application of methods would occur as decided by the persons experiencing damage or by other entities providing assistance.

Issue 5 - Effects on the Aesthetic Values of Birds

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

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

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

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

The use of lethal methods would result in temporary declines in local populations resulting from the removal of birds to address or prevent damage and threats. The goal under the proposed action is to respond to requests for assistance and to manage those birds responsible for the resulting damage. Therefore, the ability to view and enjoy birds would remain if a reasonable effort were 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 by other entities, 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. Birds could be removed by other entities with a depredation permit issued by the USFWS and/or the MDIFW (when required), under depredation orders, or during the regulated hunting seasons

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 would no longer be present for viewing or enjoying, those birds would likely be taken by another entity. Given the limited take proposed by WS under this alternative when compared to the known sources of mortality of birds and population information, 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.

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 in the State similar to Alternative 1. Birds could be lethally taken under this alternative by those entities experiencing bird damage or threats, which could 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 were conducted under any of the alternatives. Even the recommendation of non-lethal methods would likely result in the dispersal of birds from the area if those non-lethal methods recommended by WS were employed by those people 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.

Under this alternative, the effects on the aesthetic values of birds would be similar to those addressed in the proposed action. When people seek assistance with managing damage from WS or another entity, the damage level has often reached an unacceptable economic threshold for that particular person. Therefore, in the case of bird damage, the social acceptance level of those birds has reached a level where assistance is requested and those persons would likely apply methods or seek those entities that would apply those methods based on recommendations provided by WS or by other entities. Based on those recommendations, methods would likely be employed by the requestor that would result in the dispersal and/or removal of birds responsible for damage or threatening safety. If those birds causing damage were dispersed or removed by those people experiencing damage based on recommendations by WS or other entities, the potential effects on the aesthetic value of those birds would be similar to the proposed action alternative.

The impacts on aesthetics from a technical assistance program would only be lower than the proposed action if those individuals experiencing damage were not as diligent in employing those methods, as WS would be if conducting an operational program. If those people experiencing damage abandoned the use of those methods, then birds would likely remain in the area and available for viewing and enjoying for those people interested in doing so. Similar to the other alternatives, the geographical area in which damage management activities occurs would not be such that birds would be dispersed or removed from such large areas that opportunities to view and enjoy birds would be severely limited.

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 in the State. Those people experiencing damage or threats from birds would be responsible for researching, obtaining, and using all methods as permitted by federal, state, and local laws and regulations. The degree to which damage management activities would occur in the absence of assistance by any agency is unknown but likely lower compared to damage management activities that would occur where some level of assistance was provided. Birds could still be dispersed or removed under this alternative by those persons experiencing damage or threats of damage. The potential impacts on the aesthetic values of birds could be similar to the proposed action if similar levels of damage management activities are conducted by those persons experiencing damage or threats or is provided by other entities. If no action is taken or if activities were not permitted by the USFWS and the MDIFW, then no impact on the aesthetic value of birds would occur under this alternative.

Birds would continue to be dispersed and lethally taken under this alternative in the State. Lethal take would continue to occur when permitted by the USFWS and the MDIFW through the issuance of depredation permits. Take could also occur during the regulated harvest season, pursuant to the blackbird and cormorant depredation orders, pursuant to the Muscovy duck control order, and in the case of some species, take could occur any time without the need for a depredation permit.

Since birds could continue to be taken under this alternative, despite WS' lack of involvement, the ability to view and enjoy birds would likely be similar to the other alternatives. The lack of WS' involvement would not lead to a reduction in the number of birds dispersed or taken since WS' has no authority to regulate take or the harassment of birds in the State. The USFWS and the MDIFW 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, depredation permits, and under the depredation orders are regulated and adjusted by the USFWS and the MDIFW.

Those people 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 would therefore, not be additive to the birds that could be taken in the State. The impacts to the aesthetic value of birds would be similar to the other alternatives.

Issue 6 - Humaneness and Animal Welfare Concerns of Methods

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

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

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 that 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, immobilizing drugs, nest/egg destruction, 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 would be to use methods as humanely as possible to resolve requests for assistance to reduce damage and threats to human safety. WS would 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 would be to 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, immobilizing drugs, reproductive inhibitors, 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 would occur from injuries to animals while restrained, 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 by WS, WS' personnel would be present on-site during capture events or methods would be checked frequently to ensure birds captured are addressed timely and to prevent injury. Although stress could occur from being restrained, timely attention to live-captured wildlife would alleviate suffering. Stress would likely be temporary.

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 the recommendation that birds be harvested during the hunting season, 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, WS Directive 2.505) and recommended by the AVMA for use on free-ranging wildlife under field conditions (AVMA 2013).

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

Although the mode of action of DRC-1339 is not well understood, it appears to cause death primarily by nephrotoxicity in susceptible species and by central nervous system depression in non-susceptible species (Decino et al. 1966, Westberg 1969, Schafer, Jr. 1984). DRC-1339 causes irreversible necrosis of the kidney and the affected bird is subsequently unable to excrete uric acid with death occurring from uremic poisoning and congestion of major organs (Decino et al. 1966, Knittle et al. 1990). The external appearances and behavior of starlings that ingested DRC-1339 slightly above the LD_{50} for starlings appeared normal for 20 to 30 hours, but water consumption doubled after 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. DRC-1339 to manage damage caused by birds is only available to WS' personnel for use.

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

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

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

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 alpha chloralose, DRC-1339, and mesurol, could be used under any of the alternatives by those people experiencing damage regardless of WS' direct involvement. Therefore, the issue of humaneness 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. SOPs that would be incorporated into WS' activities to ensure methods are used by WS as humanely as possible are listed in Chapter 3.

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

The issue of humaneness of methods under this alternative is likely to be perceived as 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 requester 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.

Those persons requesting assistance would be directly responsible for the use and placement of methods and if monitoring or checking of those methods does not occur in a timely manner, captured wildlife could experience suffering and if not addressed timely, could experience distress. The amount of time an animal is restrained under the proposed action would be shorter compared to a technical assistance alternative if those requesters implementing methods are not as diligent or timely in checking methods. Similar to Alternative 3, it is difficult to evaluate the behavior of individual people and determining what may occur under given circumstances. Therefore, only the availability of WS' assistance can be evaluated under this alternative since determining human behavior can be difficult. If those persons seeking assistance from WS apply methods recommended by WS through technical assistance as intended and as described by WS, then those methods would be applied as humanely as possible to minimize pain and distress. If those persons provided technical assistance by WS apply methods not recommended by WS or do not employ methods as intended or without regard for humaneness, then the issue of method humaneness would be of greater concern since pain and distress of birds would likely be higher.

Alternative 3 – No Bird Damage Management Conducted by WS

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

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

Issue 7 – 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 MDIFW. Those species addressed in this EA that have established hunting seasons include Canada geese, American black ducks, mallards, hooded mergansers, common mergansers, red-breasted mergansers, wild turkeys, and American crows. For many migratory bird species considered harvestable during a hunting season, the number of birds harvested during the season is reported by the USFWS and/or the MDIFW in published reports.

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

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

With oversight of bird populations by the USFWS and the MDIFW, the number of birds that could be taken by WS would not limit the ability of those people interested to harvest those bird species during the regulated season. All take by WS would be reported to the USFWS and the MDIFW 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 by the USFWS and the MDIFW, WS' take of birds annually under this alternative would have no effect on the ability of those people interested to harvest birds during the regulated harvest season.

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

Under the technical assistance only alternative, WS would have no direct impact on bird populations in the State. If WS recommended the use of non-lethal methods and those non-lethal methods were employed by those persons experiencing damage, birds would likely be dispersed from the damage area to areas outside the damage area, which could serve to move those birds from those less accessible areas to places accessible to hunters. Although lethal methods could be recommended by WS under a technical assistance only alternative, the use of those methods could only occur after the property owner or manager received a depredation permit from the USFWS, under depredation/control orders, or take could occur during the regulated hunting season. WS' recommendation of lethal methods could lead to an increase in the use of those methods. However, the number of birds taken under a depredation permit, under depredation orders, control orders, and during the regulated hunting seasons would be determined by the USFWS and the MDIFW. Therefore, WS' recommendation of shooting or hunting under this alternative would not limit the ability of those persons interested in harvesting birds during the regulated season since the USFWS and MDIFW determine the number of birds that may be taken during the hunting season, under depredation permits, under depredation orders, and under control orders.

Alternative 3 – No Bird Damage Management Conducted by WS

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

4.2 CUMULATIVE IMPACTS OF THE PROPOSED ACTION BY ISSUE

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

Under Alternative 1 and Alternative 2, WS would address damage associated with birds either by providing technical assistance (Alternative 2) or by providing technical assistance and direct operational assistance (Alternative 1) in the State. WS would be the primary agency conducting direct operational bird damage management in the State under Alternative 1 and Alternative 2. However, other federal, State, and private entities could also be conducting bird damage management in the State. The take of native migratory bird species requires a depredation permit from the USFWS pursuant to the MBTA, which requires permit holders to report all take occurring under the permit. Take of cormorants and blackbirds can occur under depredation orders without the need for a depredation permit. Muscovy ducks can be lethally taken pursuant to a control order. Rock pigeons, European starlings, house sparrows, mute swans, feral ducks, and feral geese can be lethally taken without the need for a depredation permit since they are considered non-native species. Several species of birds addressed in this assessment can be harvested during the annual regulated harvest season.

WS does not normally conduct direct damage management activities concurrently with such agencies or other entities in the same area, but may conduct damage management activities at adjacent sites within the same period. In addition, commercial pest control companies may conduct damage management activities in the same area. The potential cumulative impacts analyzed below could occur because of WS' damage management program activities over time or because of the aggregate effects of those activities combined with the activities of other agencies and private entities. Through ongoing coordination and collaboration between WS, the USFWS, and the MDIFW, activities of each agency and the take of birds would be available. Damage management activities in the State would be monitored to evaluate and analyze activities to ensure they are within the scope of analysis of this EA.

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

Evaluation of activities relative to target species indicated that program activities would 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-induced mortality of birds from aircraft strikes, vehicle strikes, and illegal take
- Human-induced mortality through regulated harvest
- 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 populations, the USFWS and the MDIFW can adjust take levels, including the take of WS, to ensure population objectives for bird species were achieved. Consultation and reporting of take by WS would ensure the USFWS and the MDIFW considers any activities conducted by WS.

WS' take of birds in Maine from FY 2006 through FY 2011 was of a low magnitude when compared to the total known take and when compared to available population information. The USFWS and the MDIFW considers all known take when determining population objectives for birds and could adjust the number of birds that could be taken during the regulated hunting season and the number of birds lethally removed for damage management purposes to achieve the population objectives. Any take by WS would occur at the discretion of the USFWS and the MDIFW. Any bird population declines or increases induced through the regulation of take would be the collective objective for bird populations established by the USFWS and the MDIFW. Therefore, the cumulative take of birds annually or over time by WS would occur at the desire of the USFWS and the MDIFW as part of management objectives for birds in the State.

No cumulative effects on target bird species would be expected from WS' damage management activities based on the following considerations:

Historical outcomes of WS' damage management activities on wildlife

Damage management activities would be conducted by WS only at the request of a cooperator to reduce damage that was occurring or to prevent damage from occurring and only after methods to be used were agreed upon by all parties involved. WS would monitor 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 Maine have not reached a magnitude that would cause adverse impacts to bird population in the State.

SOP and strategies built into the WS program

SOPs 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 implementation is insured through monitoring, in accordance with the WS' Decision Model (Slate et al. 1992).

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 would not occur, but would likely disperse those individuals to other areas. Exclusionary methods often require constant maintenance or application to ensure effectiveness. Therefore, the use of exclusionary devices would 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 nesting sites. The use of visual and auditory harassment and dispersal methods would generally be 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 affect 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 would be employed to confine or restrain target bird species that would be subsequently euthanized using humane methods. With all live-capture devices, non-target wildlife captured can be released on site if determined to be able to survive following release. 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 would not affect non-target species.

Chemical methods available for use under the proposed action would be mesurol, nicarbazin, alpha chloralose, DRC-1339, and repellents that are described in Appendix B. Except for repellents that would be applied directly to the affected resources, all chemical methods would be employed using baits that would be highly attractive to target species and would be used in areas where exposure to non-targets would be minimal. The use of those methods requires an acclimation period and monitoring of potential bait sites for non-target activity. All chemicals would be used according to product label, which ensure that proper use would minimize non-target threats. WS' adherence to directives and SOPs governing the use of chemicals also ensures non-target hazards would be minimal.

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

All label requirements of DRC-1339 would be followed to minimize non-target hazards. As required by the label, all potential bait sites are pre-baited and monitored for non-target use as outlined in the pre-treatment observations section of the label. If non-targets were observed feeding on the pre-bait, the plots would be abandoned and no baiting would occur at those locations. Once sites were baited, sites would be monitored daily to observe for non-target feeding activity. If non-targets were observed feeding on bait, those sites would be abandoned. WS would retrieve all dead birds to the extent possible, following treatment with DRC-1339 to minimize secondary hazards associated with scavengers feeding on bird carcasses.

Only those repellents registered for use in the State by the EPA and the MDABPC would be used or recommended by WS as part of an integrated approach to managing damage and threats associated with birds. The recommendation and/or use of repellents would also follow all label instructions approved by the EPA. Repellents would be registered in accordance with the FIFRA through a review process administered by the EPA. The FIFRA requires the registration, classification, and regulation of all pesticides used in the United States. Repellents available for use to disperse birds from areas of application must be registered with the EPA according to the FIFRA. Although some hazards exist from the use of repellents, hazards occur primarily to the handler and applicator. When repellents that were registered for use by the EPA in accordance to the FIFRA and were applied according to label requirements, no adverse effects to non-targets would be expected.

Repellents may also be used or recommended by the WS program in Maine to manage bird damage. The active ingredient in numerous commercial repellents is methyl anthranilate, which is a derivative of grapes and used as a flavoring in food and as a fragrance in cosmetics. Other repellents available contain the active ingredient polybutene, which when applied, creates a sticky surface which is intended to prevent perching. Although not registered for use to disperse birds in Maine, other bird repellents registered contain the active ingredient anthraquinone, which is a naturally occurring plant extract. 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 Maine when used according to label requirements.

The use of immobilizing chemicals, reproductive inhibitors, and euthanasia methods are essentially selective for target species since identification of an individual is made prior to the application of the method. Immobilizing chemicals and reproductive inhibitors are applied using hand baiting which targets individuals or groups of target species in which the birds have been acclimated to feeding on the bait in a certain location. With immobilizing drugs and reproductive inhibitors, all unconsumed bait must be retrieved after each application, which further limits non-target exposure. With immobilizing chemicals, the applicator is present on-site at all times to retrieve sedated birds, which allows for constant monitoring for non-targets in the area of application. Euthanasia methods require the target bird species to be restrained before application, which allows any non-targets to be released if captured. Therefore, the use of those methods would not affect non-target species.

The methods described in Appendix B have a high level of selectivity and can be employed using SOPs to ensure minimal effects to non-targets species. Non-targets were not taken by WS in Maine during activities to alleviate bird damage from FY 2006 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 of non-targets under the proposed action would not cumulatively affect non-target species. WS' has reviewed the T&E species listed by the MDIFW, the USFWS, and the National Marine Fisheries Services and has determined that the bird damage management activities proposed under Alternative 1 would have no effect on the status of T&E species in the State. Cumulative impacts would be minimal on non-targets from any of the alternatives discussed.

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 would be used after careful consideration of the safety of those people employing methods and to the public. Capture methods would be employed where human activity was minimal to ensure the safety of the public, whenever possible. Capture methods also require direct contact to trigger ensuring that those methods, when left undisturbed would have no effect on human safety. All methods are agreed upon by the requesting entities, which would be 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 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 would 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 would not cumulatively affect human safety.

Repellents to disperse birds from areas of application are available. All repellents must be registered with the EPA according to the FIFRA and registered for use in the State. 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 adverse effects to human safety would be expected.

Chemical methods available for use under the proposed action are repellents, reproductive inhibitors, immobilizing drugs, and euthanizing chemicals described in Appendix B. Repellents are commercially available to the public and can be applied over large areas to discourage birds from feeding in an area. The active ingredients of those repellents available for birds are methyl anthranilate and anthraquinone. Methyl anthranilate, which has been classified by the FDA as a product that is "*generally recognized as safe*", is a naturally occurring chemical found in grapes, and is synthetically produced for use as a grape food flavoring and for perfume (see 21 CFR 182.60). The EPA exempts methyl anthranilate from the requirement of establishing a tolerance for agricultural applications (see 40 CFR 180.1143). The final ruling published by the EPA on the exemption from the requirement of a tolerance for methyl anthranilate concludes with reasonable certainty that no harm would occur from cumulative exposure to the chemical by the public, including infants and children, when applied according to the label and according to good agricultural practices (see 67 FR 51083-51088). Based on the use patterns of methyl anthranilate and the conclusions of the FDA and the EPA on the toxicity of the chemical, WS' use of methyl anthranilate and the recommendation of the use the chemical would not have cumulative impacts.

Additional repellents contain the active ingredient anthraquinone. Overall, the EPA considers the toxicological risk from exposure to anthraquinone to be negligible (EPA 1998). The EPA also considers the primary cumulative exposure is most likely to occur to handlers and/or applicators from dermal, oral, and inhalation exposure but consider the exposure risks, when appropriate measures are taken, to be negligible (EPA 1998). Therefore, the EPA concluded that cumulative effects were not expected from any common routes of toxicity (EPA 1998). Based on the known use patterns and the conclusions of the EPA, no cumulative effects are expected from WS' use of anthraquinone or the recommendation of the use of anthraquinone.

DRC-1339 may be used by WS or recommended by WS for use to manage damage or threats associated with birds in Maine. 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 are exposed to 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 (EPA 1995). Additionally, the relatively small quantity of DRC-1339 that could potentially be used in bird damage management programs in Maine, 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. WS did not use DRC-1339 from FY 2006 through FY 2011. The use of DRC-1339 under the proposed action and in other damage management activities would not be expected to increase to a level that 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 Maine.

The immobilizing drug alpha chloralose would only be available to WS for use in capturing waterfowl. To capture waterfowl, alpha chloralose tablets are inserted into a dough ball made out of bread and/or the powder form is formulated onto whole kernel corn or mixed and used with bread baits. After an acclimation period where waterfowl are habituated to feeding on certain bait, being fed at a certain time, and at a certain location, treated baits are substituted for the pre-bait. As required by WS' use of alpha chloralose under the INAD, all unconsumed bait must be retrieved. Since target wildlife are habituated to feed at a certain location and a certain time on a similar pre-bait, a general estimate of the needed bait can be determined and bait is readily consumed by target species which limits the amount of time bait is exposed. Application of alpha chloralose is limited in duration given that baiting ceases once the target birds are removed. Through acclimation, the majority of target birds can be conditioned to feed at a certain time and location, which allows for the majority of target birds to be removed after an initial application of alpha chloralose treated baits. Some follow-up baiting could occur to remove any remaining waterfowl that were not captured during the initial baiting efforts. In compliance with FDA use restrictions, the use of alpha chloralose is prohibited for 30 days prior to and during the hunting season on waterfowl and other game birds that could be hunted. Given the use patterns of alpha chloralose described, no cumulative impacts from the use of alpha chloralose to capture waterfowl are expected.

WS' personnel would be required to attend training courses on the proper use of alpha chloralose and employees using alpha chloralose must be certified in the application of alpha chloralose. Training would ensure proper care and handling occurred, ensure that proper doses were administered, and ensure human safety.

Direct application of chemical methods to target species would ensure that there are no cumulative impacts to human safety. All chemical methods would be tracked and recorded to ensure proper accounting of used and unused chemicals occurs. All chemicals would be stored and transported according to FDA regulations, including the directives of the cooperating agencies. The amount of chemicals used or stored by WS and cooperating agencies would be minimal to ensure human safety. Based on this information, the use of chemical methods as part of the proposed action by WS and cooperating agencies would not have cumulative impacts on human safety.

The only euthanasia chemical proposed for use by WS is carbon dioxide, which is an approved method of euthanasia for birds by the AVMA. Carbon dioxide is naturally occurring in the environment ranking as the fourth most abundant gas in the atmosphere. However, in high concentrations, carbon dioxide causes hypoxia due to the depression of vital centers. Carbon dioxide is considered a moderately rapid form of euthanasia (AVMA 2013). Carbon dioxide is commercially available as a compressed bottled gas. Carbon dioxide is a colorless, odorless, non-flammable gas used for a variety of purposes, such as in carbonated beverages, dry ice, and fire extinguishers. Although some hazards exist from the inhalation of high concentrations of carbon dioxide during application for euthanasia purposes, when use appropriately, the risks of exposure are minimal. Since carbon dioxide is a common gas found in the environment, the use of and/or recommending the use of carbon dioxide for euthanasia purposes with not have cumulative impacts.

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 effects from the use of those methods discussed in Appendix B would be expected given the use patterns of those methods for resolving bird damage in the State. For these reasons, WS concludes that the use of methods would not create an environmental health or safety risk to children from implementing the proposed action. It is not anticipated that the proposed action or the other alternatives would result in any adverse or disproportionate environmental impacts to minorities and persons or populations of low income people.

Issue 4 - Effectiveness of Damage Management Methods

As discussed in Chapter 2, the effectiveness of any damage management program could be defined in terms of losses or risks potentially reduced or prevented which is based on how accurately the practitioner diagnoses the problem, the species responsible for the damage, and how actions are implemented to correct or mitigate risks or damages. The most effective approach to resolving any 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).

Effectiveness is based on the types of methods employed, the application of the method, restrictions on the use of the method(s), the skill of the personnel using the method and, for WS' personnel, the guidance provided by WS' Directives and policies. The goal of the WS' program is to reduce damage, risks, and conflicts with wildlife as requested. WS recognizes that localized population reduction could be short-term and that new individuals may immigrate, be released at the site, 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 were unsuccessful, but that periodic management may be necessary.

Correlated with the effectiveness of methods at reducing or alleviating damage or threats would be the costs associated with applying methods to reduce damage or threats. If methods are ineffective at reducing or alleviating damage or if methods require re-application after initially being successful, the costs associated with applying those methods increases. An analysis of cost-effectiveness in many damage management situations is difficult or impossible to determine because the value of benefits may not be readily calculable and personal perspectives differ about damage. For example, the potential benefit of eliminating geese from defecating on public use areas could reduce incidences of illness among an unknown number of users. Since some bird-borne diseases are potentially fatal, or severely debilitating, the value of the benefit may be high. However, no studies of disease problems with and without bird damage management have been conducted, and, therefore, the number of cases prevented because of damage management are not possible to estimate. In addition, it is rarely possible to prove conclusively birds were responsible for individual disease cases or outbreaks, which were discussed in the EA in Chapter 1.

As part of an integrated approach to managing bird damage, WS has the ability to adapt methods to damage situations to effectively reduce or prevent damage from occurring. Under the proposed integrated approach, all methods, individually or in combination, could be employed as deemed appropriate through WS' Decision Model to address requests for assistance. WS' objective when receiving a request for assistance under the proposed action is to reduce damage and threats to human safety or to prevent damage from occurring using an integrated approach to managing bird damage. Therefore, under the proposed action, WS would employ methods adaptively to achieve that objective.

In regards to the effectiveness of methods used, Avery (2002) cited studies where lethal damage management did reduce losses to crops (Elliott 1964, Larsen and Mott 1970, Palmer 1970, Plesser et al. 1983, Tahon 1980, Glahn et al. 2000*a* as cited in Avery 2002) and posed little danger to non-target species (Glahn et al. 2000*a*). Avery (2002) also stated that it seems reasonable that local, short-term crop protection could be achieved through reduction in depredating bird populations; however, quantification of the relationship between the numbers of birds killed and the associated reduction in crop damage is lacking. Avery (2002) only states that studies demonstrating economic benefit from the use of lethal methods are lacking but does not state that lethal methods to resolve damage are not economically effective.

CEQ does not require a formal, monetized cost-benefit analysis to comply with the NEPA (40 CFR 1508.14) and consideration of this issue is not essential to making a reasoned choice among the alternatives being considered. However, the methods determined to be most effective to reduce damage and threats to human safety caused by birds and that prove to be the most cost effective would receive the greatest application. As part of an integrated approach, evaluation of methods would continually occur to allow for those methods that were most effective at resolving damage or threats to be employed under similar circumstance where birds were causing damage or posed a threat. Additionally, management operations could 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 was discussed as an issue in Chapter 2 of this EA.

As stated in this EA, WS would only provide assistance after a request has been received and a cooperative service agreement or other comparable document has been signed by WS and the requesting entity in which all methods used to address birds causing damage are agreed upon. Methods employed to manage bird damage, whether non-lethal or lethal, are often temporary with the duration dependent on many factors discussed in the EA. WS employs only those methods as agreed upon by the requestor after available methods are discussed.

Concern is often raised that birds only return to an area where damage was occurring if lethal methods are used which creates a financial incentive to continue the use of only lethal methods. However, as stated throughout the EA, the use of non-lethal methods are also often temporary which could result in birds returning to an area where damage was occurring once those methods are no longer used. Birds would return if suitable habitat continues to exist at the location where damage was occurring and bird densities are sufficient to occupy all available habitats. Therefore, any reduction or prevention of damage from the use of methods addressed in the EA would be temporary if habitat conditions continue to exist. Any method that disperses or removes birds from areas would only be temporary if habitat continues to exist the following year when birds return to nest. Dispersing birds using pyrotechnics, repellents, border collies, effigies, or any other non-lethal method addressed in the EA often requires repeated application to discourage birds, which increases costs, moves birds to other areas where they could cause damage, and are temporary if habitat conditions remain unchanged. Dispersing and translocating birds could be viewed as moving problem birds from one area to another, which would require addressing damage caused by those birds at another location. WS' recommendation of or use of techniques to modifying existing habitat or making areas unattractive to birds was addressed in the EA and in Appendix B. Therefore, WS' objective would be 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 adapt methods in an integrated approach to managing bird damage that is agreed upon by the cooperator. WS' legislative authority to manage animal damage was also addressed in Chapter 1 of this EA.

Issue 5 - 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 droppings 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 MDIFW 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 MDIFW. Since those persons seeking assistance could remove birds from areas where damage was occurring with or without a permit from the USFWS or the MDIFW, 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.

Issue 6 - 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) would 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 would be applied according to AVMA guidelines for free-ranging wildlife. Shooting would occur in limited situations and personnel would 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 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 would be evaluated to ensure SOPs were 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.

Issue 7 – 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 populations of those species. Since all take of birds is regulated by the USFWS and the MDIFW, 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 of the known annual take that occurs during the harvest seasons.

With oversight of bird take, the USFWS and the MDIFW 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 MDIFW objectives for bird populations in the State.

CHAPTER 5 - LIST OF PREPARERS AND PERSONS CONSULTED

5.1 LIST OF PREPARERS/REVIEWERS

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APPENDIX A
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APPENDIX B

METHODS AVAILABLE FOR RESOLVING OR PREVENTING BIRD DAMAGE IN MAINE

The most effective approach to resolving wildlife damage problems would be to integrate the use of several methods, either simultaneously or sequentially. An adaptive plan would integrate and apply practical methods of prevention and reduce damage by birds while minimizing harmful effects of damage reduction measures on people, other species, and the environment. An adaptive plan may incorporate resource management, physical exclusion and deterrents, and population management, or any combination of these, depending on the characteristics of specific damage problems.

In selecting damage management techniques for specific damage situations, consideration would be given to the responsible species and the magnitude, geographic extent, duration and frequency, and likelihood of bird damage. Consideration would also be given to the status of target and potential non-target species, local environmental conditions and impacts, social and legal aspects, and relative costs of damage reduction options. The cost of damage reduction may sometimes be a secondary concern because of the overriding environmental, legal, and animal welfare considerations. Those factors would be evaluated in formulating damage management strategies that incorporate the application of one or more techniques.

A variety of methods would potentially be available to the WS program in Maine relative to the management or reduction of damage from birds. Various federal, state, and local statutes and regulations and WS directives would govern WS' use of damage management methods. WS would develop and recommend or implement strategies based on resource management, physical exclusion, and wildlife management approaches. Within each approach there may be available a number of specific methods or techniques. The following methods could be recommended or used by the WS program in Maine. Many of the methods described would also be available to other entities in the absence of any involvement by WS.

NON-LETHAL WILDLIFE DAMAGE MANAGEMENT METHODS

Non-lethal methods consist primarily of tools or devices used to disperse or capture a particular animal or a local population of wildlife to alleviate damage and conflicts. Most of the non-lethal methods available to WS would also be available to other entities within the State and could be employed by those entities to alleviate bird damage.

Habitat alteration can be the planting of vegetation unpalatable to wildlife or altering the physical habitat (Conover and Kania 1991, Conover 1992). Conover (1991) found that even hungry Canada geese refused to eat some ground covers such as common periwinkle (*Vinca minor*), English ivy (*Hedera helix*) and Japanese pachysandra (*Pachysandra terminalis*). Planting less preferred plants or grasses to discourage geese from a specific area could work more effectively if good alternative feeding sites are nearby (Conover 1985). However, the manipulation of turf grass varieties in urban/suburban, heavy use situations such as parks, athletic fields, and golf courses is often not feasible. Varieties of turf grass that grow well and can withstand regular mowing and regular/heavy human use include Kentucky blue grass, red fescue, perennial bent grass, perennial rye grass, and white clover. All of these grasses are appealing to most waterfowl. The turf grass varieties that are not appealing to geese, such as tall fescue, orchard grass, and timothy, do not withstand regular mowing and/or regular/heavy human use.

Fences, hedges, shrubs, boulders, and other structures can be placed at shorelines to impede waterfowl movements. Restricting a bird's ability to move between water and land would deter them from an area, especially during molts (Gosser et al. 1997). However, people are often reluctant to make appropriate landscape modifications to discourage waterfowl activity (Breault and McKelvey 1991, Conover and

Kania 1991). Unfortunately, both humans and geese appear to find lawn areas near water attractive (Addison and Amernic 1983), and conflicts between humans and geese would likely continue wherever this interface occurs.

Habitat modification can be an integral part of bird damage management. Wildlife production and/or presence are often 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 would be responsible for implementing habitat modifications, and WS would only provide advice on the type of modifications that would provide the best chance of achieving the desired effect. Habitat management would most often be a primary component of 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. For example, habitat management would often be necessary to minimize damage caused by crows, blackbirds, and starlings that form large roosts during late autumn and winter. Bird activity can be greatly reduced at roost sites by removing all the trees, selectively thinning trees, or pruning trees. Habitat modification would be available to all entities.

Supplemental Feeding and Lure crops are food resources planted to attract wildlife away from more valuable resources (*e.g.*, crops). Food is provided so that the animals causing damage would consume it rather than the resource being protected. In feeding programs, target wildlife would be offered an alternative food source with a higher appeal with the intention of luring them from feeding on affected resources. This method can be ineffective if other food sources are available. For example, lure crops would largely be ineffective for geese since food resources (turf) are readily available. For lure crops to be effective, the ability to keep birds from surrounding fields would be necessary, and the number of alternative feeding sites must be minimal (Fairaizl and Pfeifer 1988). Additionally, lure crops reduce damage for only a short time (Fairaizl and Pfeifer 1988) and damage by birds is generally continuous. The resource owner would be limited in implementing this method contingent upon ownership of or other ability to manage the property and the property of others. Supplemental feeding and the planting of lure crops would be available to other entities within the State.

Modifying Human Behavior would be methods recommended by WS when providing technical assistance. Recommendations would include modifying the behavior of people that may be attracting or contributing to damage being caused by birds. For example, artificial feeding of waterfowl by people can attract and sustain more birds in an area than could normally be supported by natural food supplies. This unnatural food source can result in an increase in damage caused by waterfowl. Recommendations may include altering planting dates so that crops are less vulnerable to damage when birds may be present. Modifying human behavior could include recommending people plant crops that are less attractive or less vulnerable to damage. 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, removal of spilled grain or standing water, and use of bird proof feeders (Johnson and Glahn 1994). Those recommendations made by WS would be available for implementation by other entities.

Alter Aircraft Flight Patterns could occur in cases where the presence of birds at or near airports results in threats to human safety, and when such problems cannot be resolved by other means, the alteration of aircraft flight patterns or schedules may be recommended. However, altering operations at airports to decrease the potential for bird strike hazards would generally not be feasible unless an emergency exists. Otherwise, the expense of interrupted flights and the limitations of existing facilities generally make this practice prohibitive.

Removal of Domestic Waterfowl could be recommended or implemented by WS and other entities to alleviate damage. Flocks of urban/suburban domestic waterfowl are known to act as decoys and attract other migrating waterfowl (Crisley et al. 1968, Woronecki 1992). Avery (1994) reported that birds learn to locate food resources by watching the behavior of other birds. The removal of domestic waterfowl from water bodies removes birds that act as decoys in attracting other waterfowl. Domestic waterfowl could also carry diseases, which threaten wild populations. Property or resource owners may be reluctant to remove some or all decoy birds because of the enjoyment of their presence.

Electric Fencing could be recommended or implemented by WS and others to alleviate damage caused by waterfowl. The application of electrified fencing would generally be limited to rural settings, due to the possibility/likelihood of interaction with people and pets. Limits of this application arise where there are multiple landowners along the wetland, pond, or lake, the size of the area, and its proximity to bodies of water used by waterfowl. Perceptions from Minnesota on the effectiveness of electric fences were high (Cooper and Keefe 1997). While electric fencing may be effective in repelling waterfowl in some urban settings, its use is often prohibited in many municipalities for human safety reasons. Problems that typically reduce the effectiveness of electric fences include vegetation on fence, flight capable birds, fencing knocked down by other animals (*e.g.*, white-tailed deer and dogs), and poor power.

Barrier Fencing could also be recommended or implemented by WS and others. The construction or placement of physical barriers has limited application for birds and would primarily be recommended or employed to alleviate waterfowl damage. Barriers can be temporary or permanent structures. Lawn furniture/ornaments, vehicles, boats, snow fencing, plastic hazard fencing, metal wire fencing, and multiple strand fencing have all been used to limit the movement of Canada geese. The application of this method would be limited to areas that could be completely enclosed and do not allow waterfowl to land inside enclosures. Similar to most abatement techniques, this method has been most effective when dealing with small numbers of breeding geese and their flightless young along wetlands and/or waterways. Unfortunately, there have been situations where barrier fencing designed to inhibit goose nesting has entrapped young and resulted in starvation (Cooper 1998). The preference for geese to walk or swim, rather than fly, during this time period contributes to the success of barrier fences. Birds that are capable of full or partial flight render this method useless, except for enclosed areas small enough to prevent landing. Exclusion adequate to stop bird movements can also restrict movements of livestock, people, and other wildlife (Fuller-Perrine and Tobin 1993).

Surface Coverings could be recommended or employed by WS and others to discourage birds from using areas, primarily waterfowl. For example, plastic balls approximately five inches in diameter can be used to cover the surface of a pond and prevent access by waterfowl. A "*ball blanket*" renders a pond unusable for boating, swimming, fishing, and other recreational activities. This method can be very expensive depending on the area covered.

Overhead wire grids consist of wire (*e.g.*, fishing line) grid that is stretched taught over a resource to prevent access by birds. The birds apparently fear colliding with the wires and thus avoid flying into areas where the method has been employed. Johnson (1994) found that wire grids could deter crow use of specific areas where they are causing a nuisance. Waterfowl may be excluded from ponds using overhead wire grids (Fairaizl 1992, Lowney 1993) and are most applicable on ponds of two acres or less. Exclusion may be impractical in most settings (*e.g.*, commercial agriculture); however, wire grids could be practical in small areas (*e.g.*, personal gardens) or for high-value crops (*e.g.*, grapes) (Johnson 1994). A few people would find exclusionary devices such as wire grids unsightly, trashy, and a lowering of the aesthetic value of the neighborhood when used over personal gardens. Wire grids generally render an area unusable by people. The cost of constructing and maintaining wire grids could be burdensome for some people.

Visual scaring techniques such as Mylar tape (highly reflective surface produces flashes of light that startles birds), eyespot 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, Tobin et. al. 1988). Reflective tape has been used successfully to repel some birds from crops when spaced at three to five meter intervals (Bruggers et al. 1986, Dolbeer et al. 1986). Mylar flagging has been reported effective at reducing migrant Canada goose damage to crops (Heinrich and Craven 1990). Other studies have shown reflective tape ineffective (Bruggers et al. 1986, Dolbeer et al. 1986, Tobin et al. 1988, Conover and Dolbeer 1989). 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. Visual scaring techniques can be impractical in many locations and has met with some concerns due to the negative aesthetic appearance presented on the properties where those methods are used.

Dogs can be effective at harassing waterfowl and keeping them off turf and beaches (Conover and Chasko 1985, Castelli and Sleggs 2000). Around water, this technique appears most effective when the body of water to be patrolled is less than two acres in size (Swift 1998). Although dogs can be effective in keeping waterfowl off individual properties, they do not contribute to a solution for the larger problem of overabundant goose populations (Castelli and Sleggs 2000). Swift (1998) and numerous individuals in New Jersey have reported that when harassment with dogs ceases, the number of geese returns to pre-treatment numbers. WS has recommended and encouraged the use of dogs where appropriate.

Scarecrows and Effigies often depict predator animals (*e.g*., alligators, owls), people, or mimic distressed target species (*e.g*., dead geese, dead vultures) and they are intended to elicit a flight response from target birds, which disperses those birds from the area. Avery et al. (2002) and Seamans (2004) found that the use of vulture effigies were an effective non-lethal method to disperse roosting vultures. Avery et al. (2008) found that effigies could be effective as dispersing crows. However, Conover and Chasko (1985) found an integrated approach (using swan and predator effigies, distress calls and non-lethal chemical repellents) to be ineffective at scaring or repelling nuisance waterfowl. While Heinrich and Craven (1990) reported that using scarecrows reduced migrant Canada goose use of agricultural fields in rural areas, their effectiveness in scaring geese from urban/suburban areas was severely limited because geese were not afraid of humans as a result of nearly constant contact with people. In general, scarecrows would be most effective when they were moved frequently, alternated with other methods, and were well maintained. However, scarecrows tend to lose effectiveness over time and become less effective as populations increase (Smith et al. 1999).

Distress Calls are electronic devices that mimic the sounds exhibited when target species are in distress, which is intended to cause a flight response and disperse target animals from the area. Aguilera et al. (1991) found distress calls ineffective in causing migratory and resident geese to abandon a pond. Although, Mott and Timbrook (1988) reported distress calls as effective at repelling resident geese 100 meters from the distress unit, the birds would return shortly after the calls stopped. The repellency effect was enhanced when pyrotechnics were used with the distress calls. In some situations, the level of volume required for this method to be effective in urban/suburban areas would be prohibited by local noise ordinances. A similar device, which electronically generates sound, has proven ineffective at repelling migrant waterfowl (Heinrich and Craven 1990).

Birds hazed from one area where they are causing damage frequently move to another area where they cause damage (Brough 1969, Conover 1984, Summers 1985, Swift 1998). Smith et al. (1999) noted that others have reported similar results, stating "*biologists are finding that some techniques (e.g., habitat modifications or scare devices) that were effective for low to moderate population levels tend to fail as flock sizes increase and waterfowl become more accustomed to human activity*". Whitford (2003) used a combination of noise harassment, dogs, nest displacement, and visual harassment to chase geese from an urban park during the nesting season. Birds responded by dispersing and continued harassment with alarm calls prevented recolonization of the site during the nesting season. In generally, birds tend to habituate to hazing techniques (Zucchi and Bergman 1975, Summers 1985, Aubin 1990).

Lasers and Lights are avian damage management methods that have evaluated for a number of species (Glahn et al. 2000*b*, Blackwell et al. 2002). For best results and to disperse numerous birds from a roost, a 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 pigeons and mallard with birds habituating in approximately 5 minutes and 20 minutes, respectively (Blackwell et al. 2002).

Research on this potential tool has been conducted in a replicated format only for double-crested cormorants (Glahn et al. 2000*b*). Moving the laser light through the tree branches rather than touching birds with the laser light elicited an avoidance response from cormorants (Glahn et al. 2000*b*). During pen trials with lasers, the cormorants were inconsistent in their response with some birds showing no response to the laser (Glahn et al. 2000*b*). The lack of overt response by cormorants to lasers is not clearly understood, but suggests laser light is not a highly aversive agent (Glahn et al. 2000*b*). Blackwell et al. (2002) tested lasers on several bird species and observed varied results among species. Lasers were ineffective at dispersing starlings and cowbirds (Blackwell et al. 2002). Lasers were found to be only moderately effective for harassing geese, with significant reduction in night roosting, but little to no reduction in diurnal activity at the site pre- and post-use (Sherman 2003). Similar to the use of lasers, application of spotlights to haze birds from night roosts has proven to be a moderately effective method. It is a method that can be incorporated with other methods in integrated management plans (VerCauteren et al. 2003).

Pyrotechnics (screamer shells, bird bombs, and 12-gauge cracker shells) have been used to repel many species of birds (Booth 1994). Aguilera et al. (1991) found 15 mm screamer shells effective at reducing resident and migrant Canada geese use of areas in Colorado. However, Mott and Timbrook (1988) and Aguilera et al. (1991) doubted the efficacy of harassment and believed that moving the geese simply redistributed the problem to other locations. These devices are sometimes effective but usually only for a short period 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 because of pyrotechnics and propane cannon use.

Fairaizl (1992) and Conomy et al. (1998) found the effectiveness of pyrotechnics highly variable among different flocks of waterfowl. Some flocks in urban areas required continuous harassment throughout the day with frequent discharges of pyrotechnics. The waterfowl usually returned within hours. A minority of resident Canada goose flocks in Virginia showed no response to pyrotechnics (Fairaizl 1992). Some flocks of Canada geese in Virginia have shown quick response to pyrotechnics during winter months, suggesting migrant geese made up some or all of the flock (Fairaizl 1992). Shultz et al. (1988) reported fidelity of resident Canada geese to feeding and loafing areas is strong, even when heavy hunting pressure is ongoing. Mott and Timbrook (1988) concluded that the efficacy of harassment with pyrotechnics was partially dependent on availability of alternative loafing and feeding areas. Although one of the more effective methods of frightening geese away, more often than not pyrotechnics simply move geese to other areas. There are also safety and legal implications regarding their use. Discharge of pyrotechnics is inappropriate and prohibited in some urban/suburban areas. Pyrotechnic projectiles can start fires, ricochet off buildings, pose traffic hazards, trigger dogs to bark incessantly, and annoy and possibly injure people. Use of pyrotechnics in certain municipalities would be constrained by local firearm discharge and noise ordinances.

Paintballs and recreational paintball equipment may be used to supplement other harassment methods. Paintballs consist of a gelatin shell filled with a non-toxic glycol and water-based coloring that rapidly dissipates and is not harmful to the environment. A paintball marker (or gun) uses compressed CO_2 to propel paintballs an average of 280 feet per second, though they are not very accurate. The discharge of the paintball marker combined with the sound of paintballs hitting the ground or splashing in water may be effective in dispersing birds, especially when combined with other harassment techniques. Though paintballs break easily and velocity rapidly decreases with distance, firing at close range is discouraged to avoid harming birds. As with pyrotechnics, use of paintballs may be restricted in some areas by local ordinances.

Propane Cannons produce a noise that is intended to represent a firearm discharge. Cannons are attached to a propane tank and regulated to discharge at certain intervals. Propane cannons are generally inappropriate for urban/suburban areas due to the repeated loud explosions, which many people would consider a serious and unacceptable nuisance and potential health threat (hearing damage). Although a propane cannon can be an effective dispersal tool for birds in agricultural settings, resident waterfowl in urban areas are more tolerant of noise and habituate to propane cannons relatively quickly.

Avitrol is a chemical frightening agent (repellent) that can be effective in a single dose when mixed with untreated baits, normally in a 1:9 ratio. However, birds consuming treated baits are generally killed (Johnson and Glahn 1994). Prebaiting is usually necessary to achieve effective bait acceptance by the target species. This chemical has been 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, the affected bird begins to broadcast distress vocalizations and display abnormal flying behavior; thereby, frightening the remaining birds away.

Avitrol is a restricted use pesticide that can only be sold to certified applicators and has been available in several bait formulations where only a small portion of the individual grains carries the chemical. It can be used during anytime of the year, but is used most often during winter and spring. Any granivorous bird associated with the target species could be affected by Avitrol. Avitrol is water soluble, but laboratory studies demonstrated that Avitrol is strongly absorbed onto soil colloids and has moderately low mobility. Biodegradation is expected to be slow in soil and water, with a half-life ranging from three to 22 months. However, Avitrol may form covalent bonds with humic materials, which may serve to reduce its availability for intake by organisms from water, is non-accumulative in tissues, and rapidly metabolized by many species (Schafer, Jr. 1991).

Avitrol is acutely toxic to avian and mammalian species; however, blackbirds are more sensitive to the chemical and there is little evidence of chronic toxicity. Laboratory studies with predator and scavenger species have shown minimal potential for secondary poisoning and during field use; only magpies and crows appear to have been affected (Schafer, Jr. 1991). However, a laboratory study by Schafer, Jr. et al. (1974) showed that magpies exposed to two to 3.2 times the published LD_{50} in contaminated prey for 20 days were not adversely affected and three American kestrels that were fed contaminated blackbirds for seven to 45 days were not adversely affected. Some hazards may occur to predatory species consuming unabsorbed chemical in the gastrointestinal tract of affected or dead birds (Schafer, Jr. 1981, Holler and Shafer, Jr. 1982).

Methyl anthranilate has been used as an artificial grape flavoring in foods and soft drinks for human consumption. Methyl anthranilate could be used or recommended by WS as a bird repellent and would be available for use by other entities. Methyl anthranilate has been shown to be a promising repellent for many bird species, including waterfowl (Dolbeer et al. 1993*b*). Cummings et al. (1995) found the effectiveness of methyl anthranilate declined significantly after 7 days. Belant et al. (1996) found methyl anthranilate ineffective as a bird grazing repellent, even when applied at triple the recommended label rate. Methyl anthranilate has also been investigated 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[18]), nontoxic to rats in an inhalation study (LC_{50} > 2.8 mg/L[19]), 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 (Dolbeer et al. 1992). It has been listed as "*Generally Recognized as Safe*" by the FDA (Dolbeer et al. 1992).

Water surface and turf applications of methyl anthranilate are generally considered expensive. A potentially more cost effective method of methyl anthranilate 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 three to five times after the initial treatment before the birds abandon a treatment site.

M**esurol** 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 T&E species. Dimmick and Nicolaus (1990) showed breeding pairs of crows could be conditioned with aversive chemicals to avoid eggs. However, Avery and Decker (1994) observed increased consumption of eggs treated with higher doses of Mesurol by Fish Crows. Sullivan and Dinsmore (1990) reported bird nests greater than 700 meters from crow nests were relatively safe from crow predation, thus nests beyond 700 meters from active crow nests may not need to be treated.

WS would treat eggs similar in appearance as those eggs of the species needing protection. The active ingredient is injected into eggs, which are placed in artificial nests or upon elevated platforms. Upon ingestion, 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 would be posted with warning signs at access points to exclude people from T&E species nesting areas. Treated eggs would not be placed in locations where T&E 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.

Particulate feed additives have been investigated for their bird-repellent characteristics. In pen trials, European starlings rejected grain to which charcoal particles were adhered. If further research finds this method to be effective and economical in field application, it might become available as a bird repellent on livestock feed. Charcoal feed additives have been explored for use in reducing methane production in livestock and should have no adverse effects on livestock, on meat or milk production, or on human consumers of meat or dairy products.

Other chemical repellents have shown bird repellent capabilities. Anthraquinone is a naturally occurring chemical found in many plant species and in some invertebrates as a natural predator defense mechanism. Anthraquinone has shown effectiveness in protecting rice seed from red-winged blackbirds

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[18] 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.

[19] 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.

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). Compounds extracted from common spices used in cooking and applied to perches in cage tests have been shown repellent characteristics against roosting European starlings (Clark 1997). Naphthalene (mothballs) was found to be ineffective in repelling European starlings (Dolbeer et al. 1988).

Live traps generally allow target bird species to enter inside the trap but prevent them from exiting the trap. Bird live-captured in traps could be translocated or euthanized. Live traps include:

Bow nets are normally used for raptors but may also be used for European starlings, shorebirds, and other species using visual bait and/or conspecific decoys. Bow nets are remotely triggered from a nearby observation site. Once the net is triggered, the net envelopes the target birds inside the net similar to a suitcase when closed.

Box/cage traps come in a variety of styles to live-capture birds. A visual attractant or bait is generally placed inside the trap to attract target bird species. Target bird species enter the trap to through one-way doors to access the bait or attractant but are then unable to exit.

Decoy traps are similar in design to the Australian Crow Trap as reported by McCracken (1972) and Johnson and Glahn (1994) or typical pigeon traps. 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 the trap through one-way doors and are unable to exit. Active decoy traps are monitored daily, every other day, or as appropriate if food, water, and shelter are provided, to remove and euthanize excess birds and to replenish bait and water.

Drop nets could be suspended over a pre-baited site and manually or remotely triggered to drop on target animals or manually dropped on target birds from a high site such as a bridge or rooftop. Decoys may also be used to enhance the effectiveness of drop nets.

Cannon nets are normally used for larger birds, such as geese or pigeons and use mortar projectiles or compressed air to propel a net up and over birds that have been baited to a particular site.

Foothold traps could be employed to live-captures birds, primarily raptors. Johnson (1994) found that trapping with modified foothold traps could be effective in areas where a small resident crow population is present. No. 0 or 1 foothold traps with padded jaws were used to trap individual birds in areas habitually used by crows. Foothold traps could also be used atop poles to capture raptors. Pole traps are designed to live-capture raptors as they land atop a pole to perch. When landing atop the pole, raptors are captured in modified foothold traps. Traps are attached to a guide wire that runs from the trap down the pole to the ground. Once live-captured by the foothold traps, the trap and raptor slide down the guide water to the ground for handling. Traps would be monitored a minimum of twice each day to ensure raptors captured were addressed timely.

Nest box traps are effective in capturing local breeding and post breeding European Starlings and other targeted secondary cavity nesting birds (DeHaven and Guarino 1969, Knittle and Guarino 1976) and operate similar to other live-capture traps. Nest box traps allow birds to enter but not exit.

Nest/walk-in traps are similar to box or decoy traps. They are placed over an active nest or baited with food and allow the target bird to pass through a funnel, one-way, or drop down door that confines the target. Nest and walk-in traps are effective in capturing ground nesting birds such as cormorants, ducks, geese, and ground feeding birds such as rock pigeons and mourning doves.

Mist nets are more commonly used for capturing small-sized birds but can be used to capture larger birds, such as ducks and smaller raptors. It was introduced into the United States in the 1950s from Asia and the Mediterranean where it was used to capture birds for the market (Day et al. 1980). The mist net is a fine black silk or nylon net usually 3 to 10 feet wide and 25 to 35 feet long. Net mesh size determines the bird species that could be caught and overlapping pockets in the net cause birds to entangle themselves when they fly into the net. Decoys and electronic calls may also be used to enhance the effectiveness of mist nets.

Net guns/launchers are normally used for flocking birds such as waterfowl and European starlings. They use a firearm blank or compressed air to propel a weighted net up and over birds, which have been baited to a particular site or birds that do not avoid people. Net guns are manually discharged while net launchers are remotely discharged from a nearby observation site.

Raptor traps are varied in form and function and includes but is not limited to Bal-chatri, Dho Gaza traps, Phai hoop traps, and Swedish goshawk traps. These traps could be used specifically to live-trap raptors.

Corral traps could be used to live-capture birds, primarily geese and other waterfowl. Corral traps can be effectively used to live capture Canada geese during the annual molt when birds are unable to fly. Each year for a few weeks in the summer, geese are flightless as they are growing new flight feathers. Therefore, geese can be slowly guided into corral-traps.

Funnel traps could be used to live-capture waterfowl. Traps are set up in shallow water and baited. Funnel traps allow waterfowl to enter the trap but prevents the ducks from exiting. Traps would be checked regularly to address live-captured waterfowl. Captured ducks can be relocated or euthanized.

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. The solubility and mobility are believed to be moderate and environmental persistence is believed to be low. Bioaccumulation in plants and animal tissue is believed to be low. Alpha-chloralose is used in other countries as an avian and mammalian toxicant. The compound is slowly metabolized, with recovery occurring a few hours after administration (Schafer, Jr. 1991). The dose used for immobilization is designed to be about two to 30 times lower than the LD_{50}. Mammalian data indicate higher LD_{50} values than birds. Toxicity to aquatic organisms is unknown (Woronecki et al. 1990) but the compound is not generally soluble in water and therefore should remain unavailable to aquatic organisms. Factors supporting the determination of this low potential included the lack of exposure to pets, non-target species and the public, and the low toxicity of the active ingredient. Other supporting rationale for this determination included relatively low total annual use and a limited number of potential exposure pathways. The agent is currently approved for use by WS as an Investigative New Animal Drug by the FDA rather than a pesticide.

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 that 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.

Egg addling/destruction are methods 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).

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.

Live-capture and Translocation could be accomplished using methods to live-capture some bird species for translocating and releasing those birds in other areas. WS could employ those methods in Maine when the target animal(s) can legally be translocated or can be captured and handled with relative safety by WS' personnel.

Smith (1996) reported that groups of juvenile geese relocated from urban to rural settings can effectively eliminate these geese from urban areas, retain them at the release site, include them in the sport harvest, and expose them to higher natural mortality. Smith (1996) also reported that multiple survival models indicated that survival estimates of relocated juveniles were half of those of urban captured and released birds. The relocation of resident geese from metropolitan communities can assist in the reduction of overabundant populations (Cooper and Keefe 1997), and translocating geese has generally been accepted by the public as a method of reducing goose populations to socially acceptable levels (Fairaizl 1992, Powell et al. 2003). In areas where interest in hunting is high, the potential exists for moving nuisance geese to areas more accessible by hunters. In addition, the removal of geese posing or likely to pose a hazard to air safety at airports has been demonstrated to reduce the population of local geese and decrease the number of flights through the airport operations airspace, resulting in increased air safety at the Minneapolis-St. Paul International Airport (Cooper 1991).

Live capture and handling of birds poses an additional level of human health and safety threat if target birds are aggressive, large, or extremely sensitive to the close proximity of humans. For that reason, WS may limit this method to specific situations and certain species. In addition, moving damage-causing individuals to other locations can typically result in damage at the new location, or the translocated individuals can move from the relocation site to areas where they are unwanted. In addition, translocation can facilitate the spread of diseases from one area to another. High population densities of some animals may make this a poor wildlife management strategy for those species. Translocation would be evaluated by WS on a case-by-case basis. Translocation would only occur with the prior authorization of the USFWS and the MDIFW.

Nicarbazin is an EPA registered reproductive inhibitor that can be used to reduce egg production and viability in Canada geese and rock pigeons. 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 four to six 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 to limit reproduction effectively.

LETHAL METHODS WILDLIFE DAMAGE MANAGEMENT METHODS

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. WS' firearm use and safety would comply with WS Directive 2.615.

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 MDIFW 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.

Cervical dislocation is sometimes used to euthanize birds that 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 considers 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).

Carbon dioxide is sometimes used to euthanize birds that are captured in live traps. Live birds are placed in a container such as a plastic 5-gallon bucket or chamber and sealed shut. Carbon dioxide 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). Carbon dioxide 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 the gas released by dry ice. The use of carbon dioxide by WS for euthanasia purposes is exceedingly minor and inconsequential to the amounts used for other purposes by society.

Snap traps are modified rat snap traps used to remove individual European Starlings, 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.

DRC-1339 is the principal chemical method that would be used for bird damage management in the proposed action. For more than 30 years, DRC-1339 has proven to be an effective method of starling, blackbird, gull, and pigeon control at feedlots, dairies, airports, and in urban areas (Decino et al. 1966, Besser et al. 1967, West et al. 1967). Studies continue to document the effectiveness of DRC-1339 in resolving blackbird/starling problems at feedlots (West and Besser 1976, Glahn 1982, Glahn et al. 1987), dispersing crow roosts in urban/suburban areas (Boyd and Hall 1987), and Blanton et al. (1992) reports that DRC-1339 appears to be a very effective, selective, and safe means of urban pigeon population reduction. Glahn and Wilson (1992) noted that baiting with DRC-1339 is a cost-effective method of reducing damage by blackbirds to sprouting rice.

DRC-1339 is a slow acting avicide that is registered with the EPA for reducing damage from several species of birds, including blackbirds, starlings, pigeons, crows, ravens, magpies, and gulls. DRC-1339 was developed as an avicide because of its differential toxicity to mammals. DRC-1339 is highly toxic to sensitive species but only slightly toxic to non-sensitive birds, predatory birds, and mammals (Schafer, Jr. 1981, Schafer, Jr. 1991, Johnston et al. 1999). For example, starlings, a highly sensitive species, require a dose of only 0.3 mg/bird to cause death (Royall et al. 1967). Most bird species that are responsible for damage, including starlings, blackbirds, pigeons, crows, magpies, and ravens are highly sensitive to DRC-1339. Many other bird species such as raptors (Schafer, Jr. 1981), sparrows, and eagles are classified as non-sensitive. Numerous studies show that DRC-1339 poses minimal risk of primary poisoning to non-target and T&E species (EPA 1995). Secondary poisoning has not been observed with DRC-1339 treated baits, except crows eating gut contents of pigeons (Kreps 1974). During research studies, carcasses of birds that died from DRC-1339 were fed to raptors and scavenger mammals for 30 to 200 days with no symptoms of secondary poisoning observed (Cunningham et al. 1981). This can be attributed to relatively low toxicity to species that might scavenge on blackbirds and starlings killed by DRC-1339 and its tendency to be almost completely metabolized in the target birds which leaves little residue to be ingested by scavengers. Secondary hazards of DRC-1339 are almost nonexistent (Schafer, Jr. 1984, Schafer, Jr. 1991, Johnston et al. 1999). DRC-1339 acts in a humane manner producing a quiet and apparently painless death.

DRC-1339 is unstable in the environment and degrades rapidly when exposed to sunlight, heat, or ultra violet radiation. DRC-1339 is highly soluble in water but does not hydrolyze and degradation occurs rapidly in water. DRC-1339 tightly binds to soil and has low mobility. The half-life is about 25 hours, which means it is nearly 100% broken down within a week, and identified metabolites (*i.e.*, degradation chemicals) have low toxicity. DRC-1339 has several EPA Registration Labels (56228-10, 56228-17, 56228-28, 56228-29, and 56228-30) depending on the application or species involved in the damage management project.

APPENDIX C

FEDERAL LIST OF THREATENED AND ENDANGERED SPECIES IN THE STATE OF MAINE

Animals -- 18 listings

Status	***Species listed in this state and that occur in this state***
E	Beetle, American burying (*Nicrophorus americanus*)
E	Blue, Karner (*Lycaeides Melissa samuelis*)
E	Curlew, Eskimo (*Numenius borealis*)
T	Lynx, Canada (*Lynx Canadensis*)
T	Plover, piping (*Charadrius melodus*)
E	Puma (=cougar), eastern (*Puma (=Felis) concolor couguar*)
E	Ridley, Atlantic (*Lepidochelys kempi*)
E	Salmon, Atlantic (*Salmo salar*)
E	Sea turtle, leatherback (*Dermochelys coriacea*)
T	Sea turtle, loggerhead (*Caretta caretta*)
E	Sturgeon, shortnose (*Acipenser brevirostrum*)
E	Tern, roseate (*Sterna dougallii dougallii*)
E	Whale, finback (*Balaenoptera physalus*)
E	Whale, Humpback (*Megaptera novaeangilae*)
E	Whale, northern right (*Balaena glacialis (incl. australis)*)
E	Whale, Sei (*Balaenoptera borealis*)
E	Whale, Sperm (*Physeter catodon*)
E	Wolf, gray (*Canis lupus*)

Plants -- 3 listings

Status	***Species listed in this state and that occur in this state***
E	Lousewort, Furbish's (*Pedicularis furbishiae*)
T	Pogonia, small whorled (*Isotria medeoloides*)

T Orchid, Prairie white-fringed (*Platanthera leucophaea*)

APPENDIX D

STATE LIST OF THREATENED AND ENDANGERED SPECIES IN THE STATE OF MAINE

47 Listings

Status	***Birds***
E	Bittern, Least (*Lxobrychus exilis*)
T	Cormorant, Great (*Phalacrocorax carbo*) (Breeding population only)
T	Duck, Harlequin (*Histrionicus histrionicus*)
E	Eagle, Golden (*Aquila chrysaetos*)
E	Falcon, Peregrine (*Falco peregrinus*) breeding population only
T	Goldeneye, Barrow's (*Buchephala islandica*)
T	Heron, Black-crowned Night (*Nycticorax nycticorax*)
T	Moorhen, Common (*Gallinula chloropus*)
T	Owl, Short-eared (*Asio flammeus*) (breeding population only)
E	Pipit, American (*Anthus rubescens*) (breeding population only)
E	Plover, Piping (*Charadrius melodus*)
T	Puffin, Atlantic (*Fratercula arctica*)
T	Razorbill (*Alca torda*)
T	Sandpiper, Upland (*Bartramia longicauda*)
E	Sparrow, Grasshopper (*Ammodramus savannarum*)
T	Tern, Arctic (*Sterna paradisaea*)
E	Tern, Black (*Chilidonias niger*)
E	Tern, Least (*Sterna antillarum*)
E	Tern, Roseate (*Sterna dougallii*)
E	Wren, Sedge (*Cistothorus platensis*)

Status	***Reptiles and Amphibians***
T	Loggerhead (*Caretta caretta*)

E	Racer, Black (*Coluber constrictor*)
E	Turtle, Blandings (*Emys blandingii*)
E	Turtle, Box (*Terrapene Carolina*)
T	Turtle, Spotted (*Clemmys guttata*)
Status	***Mammals***
E	Cottontail, New England (*Sylvilagus transitionalis*)
T	Lemming, Northen Bog (*Synaptomys borealis*)
Status	***Fish***
T	Darter, Swamp (Etheostoma fusiforme)
E	Pickerel, Redfin (*Esox americanus americanus*)
Status	***Mollusks***
T	Floater, Brook (*Alasmidonta varicosa*)
T	Lampmussel, Yellow (*Lampsilis cariosa*)
T	Mucket, Tidewater (*Leptodea ochracea*)
Status	***Insects***
E	Arctic, Katahdin (*Oeneis polixenes katahdin*)
T	Boghaunter, Ringed (*Williamsonia lintneri*)
E	Clubtail, Rapids (*Gomphus quadricolor*)
E	Copper, Clayton's (*Lycaena dorcas claytoni*)
T	Duskywing, Sleepy (*Erynnis brizo*)
T	Fritillary, Purple Lesser (*Boloria chariclea grandis*)
E	Hairstreak, Edwards (*Satyrium edwardsii*)
E	Hairstreak, Hessel's (*Callophrys hesseli*)
E	Hairstreak, Juniper (*Callophrys gryneus*)
E	Mayfly, Roaring Brook (*Epeorus frisoni*)
T	Mayfly, Tomah (*Siphlonisca aerodromia*)
T	Moth, Twilight (*Lycia rachelae*)

T Snaketail, Boreal (*Ophiogomphus colubrinus*)

T Snaketail, Pygmy (*Ophiogomphus howei*)

T Zanclognatha, Pine Barrens (*Zanclognatha martha*)