SUPPLEMENT TO THE ENVIRONMENTAL ASSESSMENT: CANADA GOOSE DAMAGE MANAGEMENT IN THE STATE OF CONNECTICUT

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

In Cooperation with:

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

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I. INTRODUCTION

The United States Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), Wildlife Services (WS) program prepared an Environmental Assessment (EA) to analyze the potential impacts to the quality of the human environment from resolving Canada goose (*Branta canadensis*) damage or threats of damage to property, agricultural resources, natural resources, and human health and safety in Connecticut (USDA 2004). The EA documents the need for goose damage management in Connecticut and assesses potential impacts on the human environment of four alternatives to address that need. WS' proposed action in the EA implements an integrated damage management program in Connecticut to fully address the need to manage goose damage while minimizing impacts to the human environment.

II. PURPOSE

The purpose will remain as addressed in section 1.2 of the EA (USDA 2004). This supplement to the EA examines potential environmental impacts of the selected alternative (*i.e.*, proposed action alternative) as it relates to: 1) conducting disease surveillance and monitoring in wildlife populations, particularly monitoring for the presence of avian influenza and West Nile virus, 2) new information that has become available from research findings and data gathering since the issuance of the 2004 Decision and Finding of No Significant Impact (FONSI), 3) the analyses of WS' Canada goose damage management activities in Connecticut since the 2004 Decision/FONSI was issued to ensure program activities are within the impact parameters analyzed in the EA, and 4) including the United States Fish and Wildlife Service (USFWS) as a cooperating agency on the EA and this supplement to the EA for the purpose of issuing depredation permits associated with those damages or threats of damage associated with Canada geese.

III. NEED FOR ACTION

A description of the need for action to address damage and threats associated with Canada geese in the State is provided in section 1.3 of the EA (USDA 2004). The need for action addressed in the EA remains applicable to this supplement to the EA. The need for action to manage damage associated with Canada geese in Connecticut arises from requests for assistance received 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. Since the completion of the EA, the USFWS has prepared a Final Environmental Impact Statement (FEIS) to address damage associated with an increasing population of resident Canada geese to alleviate damage and threats of damage (USFWS 2005).

Geese are a difficult species to manage because they are highly mobile, able to exploit a variety of habitat types within a given area, and cannot be permanently excluded from large areas. It is rarely desirable or possible to remove or disperse all problem geese from an area, but with a proper management strategy, the number of geese and the associated problems may be reduced to a level that can be tolerated. Additionally, management of goose-related problems often exceeds the capabilities of single property owners to reduce damage to tolerable levels. In Connecticut, problem situations associated with Canada geese typically involve, but are not necessarily limited to, unacceptable accumulations of feces where geese feed and loaf, aggression during the nesting season, grazing of landscaped vegetation, damage to agricultural and natural resources, and unacceptable safety hazards for vehicles (*e.g.*, automobiles, boats, airplanes). Those problems frequently occur on private properties, residential communities, apartment/condominium complexes, municipal parks, schools, hospitals, natural/habitat restoration sites, corporate and industrial sites, office complexes, roadways, airports, and other areas (USFWS 2005).

Most requests for WS' assistance are associated with suburban areas where geese congregate on public or private ponds and forage on lawns and mowed areas associated with parks, beaches, golf courses, schools,

business campuses, and residences. Most requests for assistance are associated with the impacts of feces and grazing damage to lawns and other areas (including sidewalks, driveways, and swimming pools). Agricultural losses occur primarily in the late winter and spring from geese consuming and trampling sprouting crops. The major crops damaged are corn, soybeans, and winter wheat. In Connecticut, WS continues to receive requests for assistance from governmental and private entities to manage damage and threats associated with geese. Information regarding goose damage to those main categories is discussed in the following subsections:

Need to Resolve Damage to Agricultural Resources

The most common goose damage to agricultural resources is crop consumption (loss of the crop and revenue), 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 (USFWS 2005). Canada geese graze a variety of crops, including alfalfa, barley, beans, corn, soybeans, wheat, rye, oats, spinach, and peanuts (Atlantic Flyway Council 1999). 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 studies have shown that grazing by geese during the winter may increase rye or wheat seed yields (Clark and Jarvis 1978, Allen et al. 1985). In 2009, agricultural producers in Connecticut planted approximately 26,000 acres of corn in the State and harvested 62,000 acres of hay and alfalfa (USDA 2009).

Resident Canada geese are also a concern to livestock producers. Fecal droppings in areas where geese feed or loaf in and around livestock ponds can affect water quality and could be a source of a number of different types of bacteria, creating concerns about potential disease interactions between Canada geese and livestock. The transmission of diseases through drinking water is one of the primary concerns for a safe water supply for livestock.

Need to Reduce Threats to Human Safety

Birds can play an important role in the transmission of zoonotic diseases where humans may come into contact with fecal droppings of those birds. Few studies are available on the occurrence and transmission of zoonotic diseases in wild birds. Study of this issue is complicated by the fact that some disease-causing agents associated with birds may also be contracted from other sources. The risk of disease transmission from birds to humans is likely very low. 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. Geese can be closely associated with human habitation where interaction with geese or fecal droppings can occur. Canada geese often exhibit gregarious behavior (*i.e.*, form large groups) which can lead to accumulations of fecal droppings in areas where waterfowl forage or loaf. Accumulations of feces can be considered a threat to human health and safety due to the close association of geese with human activity. Accumulations of goose droppings in public areas are aesthetically displeasing and are often in areas where humans may come in direct contact with fecal droppings.

Geese could impact 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 is through incidental contact with contaminated material. Direct contact with fecal matter is not a likely 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 geese to humans is difficult to determine, especially given that many pathogens occur naturally in the environment or can be attributed to contamination from other sources. However, the presence of disease causing organisms in waterfowl feces increases the risks of exposure and transmission of zoonoses wherever people may encounter large accumulations of feces from waterfowl. Fleming et al. (2001) reviewed the impacts of Canada geese on water quality by addressing pathogens and nutrient loading and identified a number of hazards that geese are associated with. The USFWS has documented threats to public health from geese and has authorized the take of geese to reduce this threat in the resident Canada goose management FEIS (USFWS 2005).

Cryptosporidiosis is a disease caused by the parasite *Cryptosporidium parvum* and was not known to cause disease in humans until as late as 1976 (CDC 1998). A person can be infected by drinking contaminated water or from contact with the fecal material 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 produce life threatening infections, especially in people with compromised or suppressed immune systems (Roffe 1987, Graczyk et al. 1998). Cryptosporidiosis is 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. 1998). 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 has become recognized as one of the most common causes of waterborne disease in humans in the United States during the last 15 years (CDC 1999). Giardiasis is contracted by swallowing contaminated water or from placing contaminated surfaces into the mouth. 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.

Salmonella (*Salmonella* spp.) may be contracted by humans by handling materials soiled with bird feces (Stroud and Friend 1987). Salmonella causes gastrointestinal illness, including diarrhea.

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

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).

Escherichia coli (*E. coli*) are fecal coliform bacteria associated with fecal material of warm blooded animals. There are over 200 specific serological types of *E. coli* with the majority of serological types being harmless (Sterritt and Lester 1988). Probably the best known serological type 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 temporarily closed which can reduce the enjoyment of those areas by the public, even though they may not have been able to determine the serological type of the *E. coli*. 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). Simmons et al. (1995) used genetic fingerprinting to link fecal contamination of small ponds on Fisherman Island, Virginia to waterfowl. Microbiologists were able to implicate waterfowl and gulls as the source of fecal coliform bacteria at the Kensico Watershed, a water supply for New York City (Klett et al. 1998, Alderisio and DeLuca 1999). Also, fecal coliform bacteria counts coincided with the number of Canada geese and gulls roosting at the reservoir. Cole et al. (2005) found that geese may serve as a vector of antimicrobial resistance genes, indicating that they not only harbor and spread zoonotic diseases like *E. coli* but may spread strains that are resistant to current control measures.

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 collected. However, Roscoe (1999) did report finding *Cryptosporidium* spp. in 49 (10%) of the 500 samples, and *Giardia* sp. in 75 (15%) of the samples. 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). The USGS (2000) was able to isolate *Salmonella* spp., *Listeria* spp., *Chlamydia* spp., and *Giardia* spp. from goose feces in New Jersey (USGS 2000).

While transmission of diseases or parasites from waterfowl 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). 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 a 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 are closely associated with human habitation and they often exhibit gregarious roosting and nesting behavior. This gregarious behavior leads to accumulations of fecal droppings that can be considered a threat to human health and safety due to the close association of geese 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.

As stated previously, a common concern among those persons requesting assistance is the threat to human health and safety from disease transmission which has only been heightened from recent, widely publicized zoonoses events like the spread of West Nile Virus and Avian Influenza. However, requests are also received for assistance from a perception of a threat of physical harm from aggressive waterfowl. Canada geese thrive in urban habitat created by humans from a constant supply of food, water, and shelter. Many people enjoy wildlife to the point of purchasing food specifically for feeding wildlife despite laws prohibiting the act in many areas. The constant presence of human created food sources, readily available water supplies, and the few predators found in urban areas often increase the survival

rates and carrying capacity of wildlife species that are adaptable to those habitats. Often the only limiting factor to wildlife species in and around urban areas is the prevalence of diseases, which can be confounded by the overabundance of wildlife congregated into a small area that can be created by the unlimited amount of food, water, and shelter found within urban habitats.

Financial costs related to human health threats involving geese may include testing of water for *coliform* bacteria, cleaning and sanitizing beaches regularly of feces, contacting and obtaining assistance from public health officials, and implementing non-lethal and lethal methods of wildlife damage management. 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.

As people are increasingly living with wildlife, the lack of harassing and threatening behavior by humans toward many species of wildlife, especially around urban areas, has led to a decline in the fear wildlife have toward humans. When wildlife species begin to habituate to the presence of humans and human activity, a loss of apprehension occurs that can lead those species to exhibit threatening behavior toward humans. 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 humans, or abnormal behavior. Though geese attacking humans occurs rarely, aggressive behavior by geese does occur, especially during nest building and the rearing of eggs and chicks. Canada geese aggressively defend their nests, nesting areas, and young, and may attack or threaten pets, children, and adults (Smith et al. 1999). This is a threat because resident Canada geese often nest in high densities near areas used by people for recreational purposes such as parks, beaches, and sports fields (VerCauteren and Marks 2004). Additionally, slipping hazards can be created by the buildup of feces from geese on docks, walkways, and other areas of foot traffic.

Disease Surveillance and Monitoring

Public awareness and health risks associated with avian zoonoses have increased in recent years. One of the first avian zoonoses to gain public attention was the West Nile Virus (WNV) with outbreaks of the virus first reported in the United States in 1999. Today, WNV has been documented to occur in all 48 conterminous States. In 2008, the CDC reported 1,356 documented cases of WNV infections in humans in 45 States with 44 deaths (CDC 2009*a*). WS continues to provide technical assistance to those individuals requesting information on WNV and provides information on current WNV monitoring activities. The WS program in Connecticut is not currently actively collecting samples for WNV in the State. If a large outbreak of WNV is detected in Connecticut, WS as part of an interagency team would likely begin collecting samples from avian species as part of a disease monitoring program. This supplement to the EA will address monitoring activities for WNV through collections of avian species for sampling purposes.

Another avian zoonoses gaining public awareness is the high pathogenic H5N1 avian influenza (AI) virus. AI is an influenza virus naturally occurring in birds worldwide. Many subtypes of type A influenza virus are known with subtypes differing between types of hemagglutinin (HA) and neuraminidase (NA) proteins on the surface of the influenza virus (CDC 2009*b*). The CDC (2009*b*) reports 16 known HA protein subtypes and nine known NA protein subtypes of the influenza A virus resulting in numerous possible combinations of proteins with each combination resulting in a different subtype. Birds are known to carry all known subtypes of the influenza A virus; however, most subtypes of influenza A virus do not cause illness in birds (CDC 2009*b*). Despite a lack of clinical illness in most bird species from AI infections, AI is very contagious among birds and can cause severe illness and death in domestic birds, such as chickens, waterfowl, and turkeys (CDC 2009*b*).

Birds infected with AI shed the virus in saliva, nasal secretions, and feces. Infection can occur from direct contact with the bodily fluids of infected birds or from surfaces contaminated with bodily fluids of infected birds (CDC 2009*b*).

There are two main forms of AI infections in domestic poultry and waterfowl that are distinguished based on a high and low virulence rate. Low pathogenic AI typically goes undetected in bird species with birds showing mild symptoms, such as ruffled feathers or a reduction in egg production. High pathogenic AI is highly virulent and can spread rapidly in domestic poultry and waterfowl and can cause high mortality rates, often within 48 hours of infection (CDC 2009*b*).

AI refers to influenza virus infections that are found primarily in birds; however, the main concern with the AI virus is that human infections are known to occur (CDC 2009*b*). The risk of human infection from AI viruses is low since most AI virus subtypes do not usually infect humans. However, the CDC (2009*b*) reports that since 1997 the infection of humans with several subtypes of AI have been documented to occur. Human contraction of AI occurs mainly from contact with infected poultry and waterfowl or from contact with contaminated surfaces. Transmission of AI viruses from human to human is thought to rarely occur.

There are three subtypes of influenza viruses that are currently known to be circulating in the human population that are generically termed human influenza viruses. These three subtypes are H1N1, H1N2, and H3N2 influenza viruses. Current information indicates that those three subtypes of influenza virus commonly infecting humans likely originated from birds based on the genetic similarities of the human and avian influenza subtypes. The primary concern of influenza viruses is that selection processes are constantly changing the virus and that those changes may lead to an adaptation of AI viruses into highly contagious zoonoses (CDC 2009*b*).

The AI virus subtype of most concern in the high pathogenic H5N1 virus that occurs primarily in birds and is highly contagious with a high mortality rate in certain avian species. The CDC (2009*b*) reports that of the AI subtypes that are known to occasionally infect humans the H5N1 subtype has accounted for the greatest number of detected cases in humans and caused the most severe symptoms along with the most deaths. However, the severity of symptoms and the high number of deaths attributed to H5N1 increases the likelihood of reporting of the subtype compared to the milder symptoms of other AI viruses that are likely to go undiagnosed or unreported (CDC 2009*b*). Since 1997, reported human cases of H5N1 infections associated with outbreaks of the virus in poultry and waterfowl have occurred in Asia, parts of Europe, and Africa with more than half the reported human cases of high pathogenic H5N1 resulting in death (CDC 2009*b*). As stated previously, human to human transmission has been documented to occur rarely with most human infections occurring from direct contact with infected birds or from contact with surfaces contaminated by infectious birds. Despite the current inefficiency of transmission from human to human, the ability of the virus to change from external pressures has raised the concern that the highly virulent H5N1 virus could change to a form that readily infects humans with a high likelihood of human to human transmission (CDC 2009*b*). Since AI subtypes do not readily infect humans, an immune response to the AI subtypes does not currently exist in the majority of the human population. If the high pathogenic H5N1 virus gains the ability to readily be transmitted from human to human, the lack of immune protection in humans could lead to a pandemic that could result in a large number of deaths (CDC 2009*b*).

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

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

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

WS could continue to work as part of an interagency team in conducting surveillance for AI and WNV in bird species. Based on WS' participation in conducting disease surveillance and monitoring as part of an interdisciplinary team, WS' anticipates a need to continue efforts to monitor and detect the presence of avian zoonoses to determine threats and risks to human health and safety. This supplement to the EA will address WS' avian disease monitoring and surveillance activities, as related to sample collecting under surveillance and monitoring activities. Other communicable diseases addressed in section 1.3.4.1 of the EA will remain as addressed (USDA 2004).

Need to Reduce Threats to Aviation Safety

In addition to threats of zoonotic diseases, birds also pose a threat to human safety from being struck by aircraft. Birds struck by aircraft, especially when ingested into engines, can lead to structural damage to the aircraft leading to catastrophic failure of the aircraft. The civil and military aviation communities have acknowledged that the threat to human safety from aircraft collisions with wildlife is increasing (Dolbeer 2000). Collisions between aircraft and wildlife are a concern throughout the world because strikes threaten passenger safety (Thorpe 1996), result in lost revenue, and repairs to aircraft can be costly (Linnell et al. 1996, Robinson 1996). Aircraft collisions with wildlife can also erode public confidence in the air transport industry as a whole (Conover et al. 1995).

Generally, bird collisions occur when aircraft are near the ground. From 1990 through 2009, 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. 2011). From 1990 through 2009, 96,626 bird strikes have been reported to the Federal Aviation Administration in the United States (Dolbeer et al. 2011). From January 1990 through January 2012, 1,217 wildlife strikes were reported to the Federal Aviation Administration in Connecticut, with 76 strikes involving Canada geese (Federal Aviation Administration 2012). The number of bird strikes actually occurring is likely to be much greater, since it is estimated that only 20% to 25% of all bird strikes are reported (Conover et al. 1995, Dolbeer et al. 1995, Linnell et al. 1996, Linnell et al. 1999, Cleary et al. 2000).

Waterfowl are often involved in the greatest number of damaging strikes in which the bird species has been identified when compared to all other bird groups (Dolbeer and Wright 2008). Nationally, the resident Canada goose population probably represents the single most serious bird threat to aircraft safety (Alge 1999, Seubert and Dolbeer 2004, Dolbeer and Seubert 2006). Resident Canada geese are of particular concern to aviation because of their large size (typically 8- to 15-lbs which exceeds the 4-lb 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 2009, there were 1,238 reported strikes involving Canada geese in the United States resulting in nearly $89 million in damage and associated costs to civil aircraft (Dolbeer et al. 2011). The United States Air Force (USAF) reports that Canada geese have caused over $80 million in damage to aircraft from 1995 through 2011 (USAF 2011). In 1995, a Boeing 707 E38 AWACS jet taking off from Elmendorf Air Force Base in Alaska ingested at least 13 geese into two engines and crashed, killing all 24 crew members. The emergency landing of U.S. Airways Flight 1549 in the Hudson River in early 2009 after the aircraft ingested Canada geese into both engines (National Transportation Safety Board 2009, Marra et al. 2009) has increased the public's awareness of the dangers associated with aircraft striking wildlife (Dolbeer et al. 2009).

Bird strikes cause an estimated seven fatalities involving civilian and military aircraft each year (Linnell et al. 1996). For the period from 1990 to 2000, waterfowl (geese and ducks) comprised 11% of all bird-aircraft strikes to civil aviation reported to the FAA for which the bird species or group was reported (Cleary et al. 2002). In addition, more than 50% of Canada goose-aircraft strikes resulted in damage to the aircraft, and 28.5% resulted in a negative effect on the flight (Cleary et al. 2002).

Need to Reduce Damage to Property

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

Need to Protect Natural Resources

Canada geese can also negatively impact natural resources. Large concentrations of geese 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). WS has assisted cooperators in Connecticut in managing goose damage to wetland mitigation sites where excessive grazing on emergent vegetation necessitated re-planting of the site at significant costs. Overabundant resident Canada geese can negatively impact crops and habitats that are maintained as food and cover for migrant waterfowl and other wildlife.

The severe grazing of vegetation along levees results in the loss of turf which holds soil on manmade levees. Heavy rains on bare soil levees results in erosion which would not have occurred if the levee had been vegetated. Excessive numbers of Canada geese have been reported to be sources of nutrients and pathogens in water. Canada geese are attracted to waste water treatment plants because of the water and

available grasses. Coliform bacteria causes acidic pH levels in the water and lowers dissolved oxygen which kills aquatic organisms (Cagle 1998). Also, fecal contamination increases nitrogen levels in the pond resulting in algae blooms. Oxygen levels are depleted when the algae dies resulting in the death of aquatic invertebrates and vertebrates.

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 (P) and nitrogen (N) levels in Bosque Del Apache National Wildlife Refuge in New Mexico, Kitchell et al. (1999) found an increase in the concentration of both P and N 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 probably originates from sources within a lake being studied. In addition, assimilation and defecation converted the phosphorus into a more soluble form and, therefore was considered a form of internal loading. Waterfowl have contributed substantial amounts of P and N into lakes through feces creating excessive aquatic macrophyte growth and algae blooms (Scherer et al. 1995) and accelerated eutrophication through nutrient loading (Harris et al. 1981).

Canada geese feeding or nesting within or adjacent to nesting colonies of roseate terns (federally and state endangered) and common terns (state species of special concern) can disrupt incubation of eggs and feeding of chicks. In Connecticut, roseate terns only set up nest colonies within common tern colonies. Regular or continuous nest disturbance by Canada geese may result in nest or even colony abandonment.

IV. MONITORING

This supplement includes a summary of program activities to determine impacts to those issues identified in the EA to ensure that program activities conducted since the Decision was issued in 2004 remains within the scope of analysis contained in the EA. This supplement and future monitoring reports would document WS' activities while discussing any new information that becomes available since the completion of the EA and the last monitoring report. If WS' activities, as identified in the annual monitoring reports, are outside the scope of the analyses in the EA or if new issues are identified from available information, further analysis would occur and the EA would be supplemented to the degree as identified by those processes pursuant to the NEPA or a notice of intent to prepare an Environmental Impact Statement (EIS) would occur.

This supplement will evaluate WS' activities to resolve and prevent damage caused by Canada geese in Connecticut under the proposed action alternative described in the EA since the Decision and FONSI were signed in 2004. WS would continue to coordinate activities to alleviate or prevent damage with the Connecticut Department of Environmental Protection (CDEP) and the USFWS to ensure WS' activities are considered as part of the management objectives for geese.

V. RELATIONSHIP OF THIS DOCUMENT TO OTHER ENVIRONMENTAL DOCUMENTS

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

***Environmental Assessment: Wildlife Damage Management at Airports in Connecticut*:** The EA and the Decision/FONSI dated April 29, 2002 analyzed the environmental effects of WS' involvement in wildlife damage management at airport facilities throughout the State, including reducing threats associated with Canada geese. WS determined the action would not have any significant impact on the quality of the

human environment (USDA 2002). Pertinent information available in the EA has been incorporated by reference into this supplement.

***Atlantic Flyway Resident Canada Goose Management Plan*:** The Canada Goose Committee under the Atlantic Flyway Technical Section of the Atlantic Flyway Council set overall population goals for resident Canada geese in the Atlantic Flyway (Atlantic Flyway Council 1999). The management plan set specific management objectives to achieve the desired population levels of resident Canada geese.

USFWS Resident Canada Goose Management FEIS: Since the completion of the EA, the USFWS has issued a FEIS addressing the need for and potential environmental impacts associated with goose damage management activities (USFWS 2005). The FEIS also contains detailed analyses of the issues and methods used to manage Canada goose damage. A Record of Decision (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 USFWS FEIS (72 FR 35217). Information in the resident Canada goose FEIS has been incorporated by reference into this document.

VI. DECISIONS TO BE MADE

Based on agency relationships, Memorandum of Understandings (MOU), and legislative authorities, WS was the lead agency for the EA, and therefore, responsible for the scope, content, and decisions made. Management of migratory birds is the responsibility of the USFWS. As the authority for the management of bird populations, the USFWS was involved in the development of this supplement to the EA and provided input throughout the preparation process to ensure an interdisciplinary approach according to the NEPA and agency mandates, policies, and regulations. The CDEP is responsible for managing wildlife in the State of Connecticut, including the establishment and enforcement of regulated hunting seasons. For migratory birds, the CDEP can establish hunting seasons for geese under frameworks determined by the USFWS. WS' activities to reduce and/or prevent Canada goose damage in the State would be coordinated with the USFWS and the CDEP which ensures WS' actions would be incorporated into population objectives established by those agencies for wildlife populations in the State.

Based on the scope of the EA and this supplement to the EA, the decisions to be made are: 1) should WS continue to conduct Canada goose damage management to alleviate damage and threats in Connecticut, 2) should WS conduct disease surveillance and monitoring in Canada geese when requested by the CDEP, the USFWS, and other agencies, 3) should WS continue to implement an integrated wildlife damage management strategy, including technical assistance and direct operational assistance, to meet the need for Canada goose damage management in the State, 4) if not, should WS attempt to implement one of the alternatives to an integrated damage management strategy as described in the EA, and 5) would continuing the proposed action result in adverse impacts to the environment requiring the preparation of an EIS based on activities conducted since the completion of the EA and/or based on new information available.

VII. SCOPE OF ANALYSIS

The EA and this supplement to the EA evaluate Canada goose damage management activities in Connecticut to reduce damage to property, agricultural resources, natural resources, and to reduce threats to human safety in the State. The scope of analysis remains valid as addressed in the EA unless otherwise discussed in this supplement.

Actions Analyzed

The EA and this supplement evaluate the need for Canada goose damage management to reduce damage and threats within the State of Connecticut wherever such management is requested by a cooperator. The EA and this supplement discuss the issues associated with conducting Canada goose damage management in the State to meet the need for action and evaluate different alternatives to meeting that need while addressing those issues.

WS uses a decision model based on a publication by Slate et al. (1992) which involves evaluating each threat situation, taking action, evaluating the action, and monitoring results of the actions taken. The published article provides more detail on the processes used in WS' Decision Model. WS' programmatic FEIS (USDA 1997) provides more detail and examples of how the model is used. WS' personnel use the Decision Model to develop the most appropriate strategy to reduce damage and to determine potential environmental effects from damage management actions (Slate et al. 1992, USDA 1997, USDA 2004).

Native American Lands and Tribes

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

Period for which the EA is Valid

If the analyses in this supplement indicates an EIS is not warranted, the EA, as supplemented, would remain valid until WS, in consultation with the USFWS and the CDEP, determines that new needs for action, changed conditions, new issues, or new alternatives having different environmental impacts must be analyzed. At that time, the analysis in the EA and this supplement would be reviewed and further supplemented pursuant to the NEPA. Review of the EA and this supplement would be conducted each year to ensure that the EA is sufficient. This process ensures the EA is complete and still appropriate to the scope of Canada goose damage management activities conducted by WS in Connecticut.

Site Specificity

The EA and this supplement analyze the potential impacts of Canada goose damage management and address those activities currently being conducted by WS in Connecticut under a MOU or cooperative service agreement. The EA and this supplement also addresses the impacts of Canada goose damage management in the State where additional agreements may be signed in the future. Because the proposed action is to reduce damage and because the program's goals and directives are to provide services when requested, within the constraints of available funding and workforce, it is conceivable that additional Canada goose damage management efforts could occur at additional locations in the State when a request for assistance is received. Thus, the EA and this supplement anticipate the potential expansion of activities at location where damage management activities could be conducted and analyzes the impacts of such efforts as part of the identified alternatives. Because geese are present statewide and damage can

occur where geese occur, it is conceivable that WS' direct control activities could occur anywhere in the State when requested.

Planning for the management of goose damage must be viewed as being conceptually similar to federal or other agency actions whose missions are to stop or prevent adverse consequences from anticipated future events for which the actual sites and locations where they would occur are unknown but could be anywhere in a defined geographic area. Examples of such agencies and programs include fire and police departments, emergency clean-up organizations, and insurance companies. Although some of the sites where goose damage could occur can be predicted, all specific locations or times where such damage would occur in any given year cannot be predicted. The threshold triggering an entity to request assistance from WS to manage damage associated with geese is often unique to the individual; therefore, predicting where and when such a request for assistance would be received by WS is difficult.

Chapter 2 of the EA identifies and discusses issues relating to goose damage management in Connecticut. The EA and this supplement emphasize major issues as they relate to specific areas whenever possible; however, many issues apply wherever goose damage and the resulting management occur, and are treated as such. The standard WS' Decision Model (Slate et al. 1992, USDA 1997, USDA 2004) and WS Directive 2.105 are the routine thought processes that provide the site-specific procedure for determining methods and strategies to use or recommended for individual actions conducted by WS in the State of Connecticut. Appropriate strategies to address goose damage that are made using this thought process would be in accordance with any Standard Operating Procedures (SOP) described herein or in the EA and pursuant to WS' Directives.

The analyses in the EA and this supplement are intended to apply to any action that may occur in any location and at any time within Connecticut. In this way, WS believes it meets the intent of the NEPA with regard to site-specific analysis and that this is the only practical way for WS to comply with the NEPA and still be able to accomplish its mission. This supplement adds to the analysis in the EA and the 2004 Decision/FONSI and all information and analyses in the EA remain valid unless otherwise noted.

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

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

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

The USFWS has been a cooperating agency during the development of this supplement to the EA to analyze cumulative take of geese and from the issuance of depredation permits to entities within the State of Connecticut. The USFWS has jurisdiction over the management of migratory birds and has specialized expertise in identifying and quantifying potential adverse effects to the human environment from Canada goose damage management activities. The analyses in this supplement to the EA and the analyses in the EA would ensure the USFWS compliance with the NEPA for the issuance of depredation permits for the take of geese.

Public Involvement

The EA was made available to the public for review and comment during a 30-day public comment period by a legal notice published from April 7, 2004 through April 9, 2004 in the *Hartford Courant*. A letter of availability for the EA was also mailed directly to agencies, organizations, and individuals with probable interest in the proposed program. WS received four comment letters from the public during the public involvement process. Comments from the public involvement process were reviewed for substantive issues and alternatives which were considered in developing the Decision for the EA. WS' responses to comments received were addressed in the Decision for the EA (USDA 2004).

After consideration of the analysis contained in the EA and review of public comments, a Decision and FONSI for the EA was issued on July 15, 2004. The Decision and FONSI selected the proposed action alternative which implemented an integrated damage management program in Connecticut using multiple methods to adequately address the need to manage damage caused by Canada geese.

This supplement to the EA, along with the EA and the 2004 Decision/FONSI, will be made available for public review and comment through the publication of a legal notice announcing a minimum of a 30-day comment period. The legal notice will be published in the *Hartford Courant* and posted on the APHIS website located at http://www.aphis.usda.gov/wildlife_damage/nepa.shtml according to WS' public notification requirements (72 FR 13237-13238). A notice of availability for this supplement to the EA will also be directly mailed to agencies, organizations, and individuals with probable interest in the proposed program. Comments received during the public involvement process will be fully considered for new substantive issues and alternatives.

VIII. AUTHORITY AND COMPLIANCE

WS' activities to reduce damage and threats associated with geese are regulated by federal, state, and local laws and regulations. The authority of WS and compliance with relevant laws and regulations are discussed in detail in Section 1.8 of the EA (USDA 2004). WS' activities are also conducted consistent with relevant Executive Orders which were also discussed in Section 1.8 of the EA (USDA 2004). Compliance with laws and regulations not directly addressed in the EA will be discussed in this supplement.

Depredation Orders for Canada Geese

As discussed previously, the USFWS developed an EIS to evaluate alternatives to address the increasing resident goose population across the United States and to reduce associated damage (USFWS 2005). In addition, several depredation orders were established to manage damage associated with Canada geese without a depredation permit from the USFWS when certain criteria are occurring. Under 50 CFR 21.49, resident Canada geese can be lethally taken at airports and military airfields without the need for a depredation permit by airport authorities or their agents when those geese are causing damage or posing a threat of damage to aircraft. A Canada goose nest and egg depredation order has also been established that allows the nests and eggs of those geese causing or posing a threat to people, property, agricultural crops, and other interests to be destroyed without the need for a depredation permit once the participant has registered with the USFWS (see 50 CFR 21.50). A similar depredation order was established to manage damage to agricultural resources associated with Canada geese. Under 50 CFR 21.51, Canada geese can be lethally taken without a permit from the USFWS in those states designated, including Connecticut, 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 have been met. However, a State permit may still be required to lethally take geese.

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

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

IX. AFFECTED ENVIRONMENT

The analyses in the EA and this supplement are intended to apply to actions taken under the selected alternative that could occur in any locale and at any time within the analysis area. The EA and this supplement analyze the potential impacts of Canada goose damage management in the State based on those activities that have been conducted and are being conducted under a MOU or cooperative service agreement. The EA and this supplement also address the impacts of goose damage management in the State where additional agreements may be signed in the future between WS and a cooperating entity.

Goose damage or threats of damage can occur statewide in Connecticut where ever geese occur. However, goose damage management would only be conducted by WS when requested by a landowner or manager and only on properties where a cooperative service agreement or other comparable document has been signed between WS and a cooperating entity. Canada geese can be found throughout the year across the State where suitable habitat exists for foraging, loafing, roosting, and nesting. Geese are capable of utilizing a variety of habitats in the State but generally use areas adjacent to or near bodies of water with relatively short vegetation. Nesting habitat could include wetlands, ponds, meadows, gravel bars along rivers, islands, agricultural fields, along irrigation ditches, reservoirs, sewage lagoons, city lakes, golf courses, subdivisions, highway medians, and on top of structures. Geese are also known to loaf, roost, and forage in similar habitat near water bodies preferring areas that are open with short vegetation which allows geese to detect approaching predators. During the migration periods, geese often roost on or near bodies of water but are known to travel to other areas to forage, such as agricultural fields. Since geese can be found throughout the State, requests for assistance to manage damage or threats of damage could occur in areas occupied by geese.

The proposed action could be conducted on private, federal, state, tribal, and municipal lands in Connecticut to resolve damage to agricultural commodities, natural resources, property, and to reduce threats to public health and safety. The areas of the proposed action include, but are not limited to, property on or adjacent to airports, golf courses, athletic fields, recreational areas, swimming beaches, parks, corporate complexes, subdivisions, businesses, industrial parks, schools, agricultural areas, wetlands, restoration sites, and cemeteries. Additionally, the area of the proposed action would include airports and surrounding property where geese represent a threat to aviation safety. Goose damage management would be conducted when requested by a landowner or manager and only on properties where a cooperative service agreement or other comparable document has been signed by WS and the entity requesting assistance.

WS has reviewed the affected environment during evaluations of programs activities under the proposed action alternative through monitoring and this supplement. The affected environment has not changed since the implementation of the proposed action and continues to be as addressed in the EA.

Disease Surveillance and Monitoring Activities

Upon receiving a request for assistance, goose damage management activities could be conducted in the State to alleviate threats of damage and threats to human safety. Under the supplement to the EA, WS could conduct disease surveillance and monitoring activities for the purposes of studying, containing, and curtailing disease outbreaks in wildlife populations. Those wildlife species handled for disease sampling would be ancillary to wildlife damage management activities being conducted to alleviate damage or threats of damage (*i.e.*, wildlife would not be directly live-captured or lethally taken for disease surveillance purposes but if wildlife are live-captured or lethally taken under a selected alternative to alleviate damage or threats of damage, WS could collect samples from those wildlife species). Disease sampling of wildlife would not be the primary purpose for live-capturing or lethally taking geese in the State.

X. ISSUES ANALYZED IN DETAIL

Issues are concerns of the public and/or professional community raised regarding potential adverse effects that might occur from a proposed action. Such issues must be considered in the NEPA decision-making process. Issues relating to the reduction of wildlife damage were raised during the scoping process for WS' programmatic FEIS (USDA 1997) and were considered in the preparation of the EA (USDA 2004). Issues related to managing damage associated with Canada geese were developed by WS in consultation with the USFWS and the CDEP. The EA was also made available to the public for review and comment to identify additional issues and alternatives.

The issues analyzed in detail are discussed in Chapter 2 of the EA (USDA 2004). Alternatives developed and identified during the development of the EA to address those issues are discussed in Chapter 3 of the EA (USDA 2004). The following issues were identified during the scoping process for the EA:

- Issue 1 - Effects on Target Canada Goose Populations
- Issue 2 - Effectiveness of Canada Goose Damage Management
- Issue 3 - Effects on Aesthetic Values
- Issue 4 - Humaneness and Animal Welfare Concerns of Methods Used by WS
- Issue 5 - Effects on Non-target Wildlife Species Populations, Including T&E Species

Based on those damage management activities conducted previously by WS since the 2004 Decision and FONSI were signed and in consultation with the USFWS and the CDEP, no additional issues have been identified that require detailed analyses. Those issues identified during the development of the EA remain applicable and appropriate to resolving damage and threats of damage associated with geese in the State.

XI. ISSUES NOT CONSIDERED IN DETAIL WITH RATIONALE

WS has reviewed the issues not considered in detail as described in the EA and has determined that the analysis provided in the EA has not changed and is still appropriate. Effects on those issues continue to be insignificant.

XII. ALTERNATIVES ANALYZED IN DETAIL

The alternatives considered and evaluated using the identified issues are described and discussed in detail in Chapter 3 of the EA (USDA 2004). In addition, Chapter 4 of the EA analyzes the environmental consequences of each alternative as those alternatives relate to each of the issues identified (USDA 2004). Appendix B of the EA provides a description of the methods that could be used or recommended by WS under each of the alternatives, except the no involvement by WS alternative. The EA describes four potential alternatives that were developed to address the issues identified above. Alternatives analyzed in detail include:

Alternative 1: Integrated Wildlife Damage Management (Proposed Action/No Action)
Alternative 2: Technical Assistance Only by WS
Alternative 3: Non-lethal Only by WS
Alternative 4: No Federal WS Canada Goose Damage Management

XIII. ALTERNATIVES CONSIDERED BUT NOT ANALYZED IN DETAIL

Several alternatives were also considered to address the issues but were not analyzed in detail with the rationale discussed in the EA (USDA 2004). WS has reviewed the alternatives analyzed but not in detail and determined the analyses in the EA are still appropriate for those alternatives considered.

XIV. ADDITIONAL CANADA GOOSE DAMAGE MANAGEMENT METHODS

A description of the wildlife damage management methods that could be used or recommended by WS under the alternatives is provided in Appendix B of the EA (USDA 2004) and in Appendix J of WS' programmatic FEIS (USDA 1997). Since the completion of the EA, an avian reproductive inhibitor containing the active ingredient nicarbazin has been registered with the United States Environmental Protection Agency (EPA) as a reproductive inhibitor for Canada geese but is not currently registered for use in the State. Nicarbazin is intended for use at site specific locations in highly populated urban areas, such as office parks, recreational parks, airports, golf courses, schools, hospitals, restaurants, and industrial sites. To be effective, nicarbazin must be fed daily and consistently consumed by geese throughout the nesting season which can last from eight to ten weeks. Nicarbazin is a restricted-use pesticide that requires a pesticide applicators license to purchase and use. If reproductive inhibitors for managing localized Canada goose populations become registered for use in the State, further evaluation of the use of those products would occur pursuant to the NEPA.

XV. STANDARD OPERATING PROCEDURES

SOPs improve the safety, selectivity, and efficacy of wildlife damage management activities. The WS program in Connecticut uses many such SOPs which are discussed in detail in Chapter 3 of the EA (USDA 2004) and in Chapter 5 of WS' programmatic FEIS (USDA 1997). Those SOPs would be incorporated into activities conducted by WS when addressing Canada goose damage in the State.

XVI. ENVIRONMENTAL CONSEQUENCES FOR ISSUES ANALYZED IN DETAIL

The major issues are discussed in detail in Chapter 2 of the EA (USDA 2004). Alternatives developed and identified during the development of the EA to address those issues are discussed in Chapter 3 of the EA (USDA 2004). Potential impacts of Alternative 2, Alternative 3, and Alternative 4 on the human environment related to the major issues have not changed from those described in the EA and thus do not require additional analyses in this supplement. Chapter 4 of the EA contains a detailed discussion and comparison of the identified alternatives and the major issues (USDA 2004). The issues were identified

as important to the scope of the analysis in the EA (40 CFR 1508.25). Alternative 1 (proposed action/no action), as described in the EA, addresses requests for Canada goose damage management in the State using an integrated damage management approach by WS to reduce damage and threats of damage. The following is an analysis of potential impacts for each of the major issues analyzed in the EA since the completion of the EA and this supplement to the EA as related to Alternative 1 (proposed action/no action alternative):

Issue 1 - Effects on Target Canada Goose Populations

A common concern when addressing damage associated with wildlife species are the effects on the populations of those species from methods used to manage damage or threats of damage. The integrated approach of managing damage associated with wildlife described in the EA under the proposed action alternative would involve the use of methods to resolve requests for assistance. Methods employed in an integrated approach to reduce damage and threats are categorized into non-lethal and lethal methods. Non-lethal methods are employed to exclude, harass, and/or disperse geese from areas where damage or threats are occurring. Lethal methods are often employed to reinforce non-lethal methods and to remove those geese that have been identified as causing damage or posing a threat to human safety. Both non-lethal and lethal methods have the potential to impact wildlife populations. The EA evaluated those potential impacts and found that when WS' activities are conducted within the scope analyzed in the EA, those activities would not adversely impact wildlife populations in Connecticut (USDA 2004). WS' SOPs are designed to reduce the effects on wildlife populations and are discussed in Chapter 3 of the EA.

Although non-lethal methods can disperse geese from areas where application occurs, geese are generally unharmed. Non-lethal methods are not employed over large geographical areas or applied at such intensity that essential resources (*e.g*., nesting locations, food sources) would be unavailable for extended durations or over a wide geographical area that long-term adverse effects would occur to a species' population. Therefore, adverse effects are not often associated with the use of non-lethal methods. However, methods used to lethally take wildlife can result in local reductions in those species' populations in the area where damage or threats of damage were occurring.

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

WS has provided direct damage management and technical assistance in response to requests for assistance in Connecticut since the completion of the EA. Descriptions and application of direct damage management and technical assistance projects are discussed in detail in Chapter 3 of the EA (USDA 2004). All wildlife damage management activities conducted by WS were pursuant to applicable federal, state, and local laws and regulations.

Information on goose populations and trends are often derived from several sources including the Breeding Bird Survey (BBS), the Christmas Bird Count (CBC), waterfowl surveys, published literature, and harvest data. Further information on particular 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. The number and species of birds observed and heard within a quarter of a mile of the survey points are recorded. 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 a combined set of over 3,700 roadside survey routes conducted annually in the continental United States and southern Canada, 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. 2011). The primary objective of the BBS has been to generate an estimate of population change for all breeding birds. Populations of birds tend to fluctuate, especially locally, as a result of variable local habitat and climatic conditions. Trends can be determined using different population equations and statistically tested to determine if a trend is statistically significant.

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. 2011).

Christmas Bird Count

The CBC is conducted in December and early January annually by numerous volunteers under the guidance of the National Audubon Society (NAS). The CBC reflects the number of birds frequenting a location during the winter months and is based on birds observed within a 15-mile diameter circle around a central point (177 mi^2). The CBC data does not provide a population estimate, but can be used as an indicator of trends in the population. 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.

Annual Harvest Estimate

The Canada goose population is sufficient to allow for annual harvest seasons that occur during the fall migration period. Goose hunting seasons are established under frameworks developed by the USFWS and implemented in the State by the CDEP.

Take can also occur under several depredation orders established by the USFWS. Therefore, the take of geese can occur during annual hunting seasons and under depredation orders to alleviate damage and to alleviate threats of damage. The number of geese harvested during the season is reported by the USFWS and/or the CDEP in published reports.

Summary of Canada goose damage management activities conducted by WS in Connecticut

From the federal fiscal year (FY) 2004 through FY 2011, WS received requests for assistance to manage damage associated with Canada geese in Connecticut. Most requests for assistance were to alleviate damage or threats of damage to property. Property damage can occur from geese overgrazing turf and landscaping and from fecal matter deposited on sidewalks, walkways, and turf. Threats to human safety were also addressed. Threats to human safety arise from the potential of disease transmission associated with human contact with fecal matter or surfaces contaminated with fecal matter deposited by geese, including fecal matter being deposited in water sources. Those requests for assistance most often originated from public parks and golf courses. Human safety threats can also arise from the potential of aircraft striking geese at airports which can threaten air passenger safety. WS continues to assist airports within Connecticut in developing programs to minimize the risk of aircraft striking geese.

WS' activities to address damage caused by Canada geese using an integrated approach to resolve requests for assistance from FY 2004 through FY 2011 are summarized by year below:

WS' Goose Damage Management Activities in Connecticut during FY 2004

WS implemented an integrated approach to resolving damage associated with geese in Connecticut during FY 2004 using a combination of technical assistance and direct assistance to successfully reduce damage. Technical assistance was provided to 67 cooperators in FY 2004 involving 67 individuals. Assistance was provided to resource owners by way of information and demonstration of methods available to reduce or prevent goose damage. Requests for assistance were primarily received for the reduction of damage to property and to reduce threats to human health and safety. Many projects were conducted to reduce damage or threats to multiple resources. Where resource owners were unable to resolve damage issues on their own, WS provided direct assistance. In FY 2004, this assistance was limited to the removal of resident geese during the summer molt. As part of an integrated approach, WS employed firearms to lethally take nine geese in FY 2004 to alleviate damage to property and posing a threat to human safety. In addition, WS employed non-lethal methods to disperse 26 geese during FY 2004 to alleviate damage. No Canada goose nests or eggs were destroyed by WS during FY 2004.

Examples of WS' direct assistance in Connecticut during FY 2004 included: (1) protection of human health and safety through removal of geese at industrial sites where geese were defecating on walkways, and (2) reduction of goose-aircraft strikes, and enhancement of public safety at Connecticut airports.

WS' Goose Damage Management Activities in Connecticut during FY 2005

WS continued to provide technical assistance and direct assistance through the operational employment of methods to resolve requests to manage goose damage in Connecticut during FY 2005. Technical assistance was provided to those persons interested through recommendations and through the dissemination of information on how to effectively resolve goose damage using dispersal techniques and by altering cultural practices. A total of 31 technical assistance projects were conducted in FY 2005 by WS involving 45 individuals, as well as information on the biology of geese through the distribution of 84 handouts and leaflets.

Requests to resolve or reduce damage threats occurred primarily from the risks to property and human safety from aircraft striking geese, overgrazing of landscape by geese, and from the cost and the need to clean aesthetically displeasing goose feces from property. As part of an integrated damage management approach, WS employed both non-lethal and lethal damage management methods to resolve damage caused by geese in Connecticut.

In FY 2005, one goose was lethally taken using a firearm by WS to alleviate damage at the request of a cooperator. As part of an integrated approach to resolving damage and threats of damage, WS also employed non-lethal methods to disperse 12 geese during FY 2005 to alleviate damage. No Canada goose nests or eggs were destroyed by WS during FY 2005.

WS' Goose Damage Management Activities in Connecticut during FY 2006

WS continued to respond to request for assistance to manage damage caused by Canada geese in FY 2006. Requests were received to manage damage caused by geese to property and to reduce threats to human safety. To resolve requests for assistance, WS continued to utilize an integrated approach by assisting resource owners in implementing non-lethal methods and removing and euthanizing geese in situations where non-lethal methods were impractical or unsuccessful in resolving damage.

WS provided technical assistance during 16 occasions to 23 people in FY 2006 on preventing and resolving goose damage, as well as information on the biology of geese through the distribution of 78 handouts and leaflets.

To alleviate goose damage and threats during FY 2006, WS employed firearms to lethally take 23 geese with one goose being taken through hand capture which was subsequently euthanized by carbon dioxide. Pursuant to the proposed action, WS also employed non-lethal methods to address goose damage and threats. WS dispersed 21 geese using non-lethal methods during FY 2006 in the State. Geese were dispersed using propane cannons and the noise produced during the discharge of a firearm. Four Canada goose nests containing 17 eggs were treated or removed and destroyed by WS during FY 2006.

WS was also requested by the CDEP to live-capture 20 Canada geese after an oil spill in FY 2006. Those geese were captured and released to licensed rehabilitators for cleaning. Of the 20 geese live-captured by WS, 18 survived and were subsequently released by the rehabilitators.

WS' Goose Damage Management Activities in Connecticut during FY 2007

WS continued to provide technical assistance and operational employment of methods to resolve requests for assistance to manage goose damage in Connecticut during FY 2007. Technical assistance was provided to those persons interested through recommendations and through the dissemination of information on how to effectively resolve goose damage using dispersal techniques and by altering cultural practices. WS provided technical assistance on 11 occasions to 14 requesters in FY 2007 through the dissemination of information and making recommendations on effective methods to resolve goose damage. WS distributed 30 informational leaflets to those persons requesting assistance in FY 2007.

Operational damage management was also conducted by WS in FY 2007 through the direct integration of methods and strategies to resolve damage caused by geese in Connecticut. Requests for assistance in FY 2007 were primarily received to reduce disease transmission threats caused by human contact with goose feces and to reduce threats to human safety from aircraft striking geese at or near airports.

As described in the proposed action in the EA, WS employed methods in an integrated approach to resolve damage associated with geese in the State. To alleviate damage requests, WS employed firearms

to take 23 geese and net guns to live-capture four geese during FY 2007. Geese live-captured using the net gun were euthanized by cervical dislocation or carbon dioxide. As in previous years, WS also employed non-lethal methods to disperse geese from areas where damage was occurring. During FY 2007, WS addressed 97 geese using non-lethal methods. WS employed pyrotechnics to disperse seven geese while 90 geese were dispersed using the sound produced by the discharge of a firearm. Three Canada goose nests containing twelve eggs were treated or removed and destroyed by WS during FY 2007.

WS' Goose Damage Management Activities in Connecticut during FY 2008

WS continued to provide both technical assistance and operational assistance when requested to those persons experiencing damage associated with geese in the State. Technical assistance was provided to 36 participants during FY 2008 involving goose damage management. WS also distributed 25 leaflets and handouts on goose biology and damage management methods.

During operational assistance, WS employed firearms and net guns to lethally take 91 geese in the State during FY 2008. Requests for assistance occurred primarily from geese causing damage to property and posing threats to human safety associated with accumulations of fecal droppings in areas where people may directly contact feces or where fecal droppings are aesthetically displeasing.

As part of the integrated approach described in the EA under the proposed action, WS also employed non-lethal harassment methods to disperse geese from areas where damages were occurring during FY 2008. WS dispersed 2,872 geese during FY 2008 to alleviate damage. Geese were primarily dispersed using the noise produced from the discharge of a firearm and through the use of pyrotechnics. Six Canada goose nests containing 28 eggs were treated or removed and destroyed by WS in FY 2008.

WS' Goose Damage Management Activities in Connecticut during FY 2009

During FY 2009, WS continued to provide both technical assistance and direct operational assistance to those persons experiencing damage caused by Canada geese in the State. In FY 2009, WS conducted 17 technical assistance projects involving Canada goose damage involving 22 participants. WS also distributed 197 leaflets and handouts on goose biology and damage management methods.

WS continued to employ an integrated approach to resolving requests for operational assistance in FY 2009. As part of an integrated approach to resolving threats and damage, WS used vehicles (boats, trucks), firearms, and pyrotechnics to disperse 1,372 geese during FY 2009. As part of direct operational assistance to alleviate damage, WS employed lethal methods to take 61 geese in FY 2009. Firearms were used to lethally take 54 geese. Net guns and hand capture were employed to live capture five and two geese, respectively. Geese captured by net gun were euthanized using carbon dioxide and hand captured geese were euthanized using cervical dislocation.

In FY 2009, four nests containing 17 eggs were treated or destroyed by WS in Connecticut. Of these, three were destroyed after one or both adults were removed.

WS' Goose Damage Management Activities in Connecticut during FY 2010

During FY 2010, WS continued to provide both technical assistance and direct operational assistance to those persons experiencing damage caused by Canada geese in the State. In FY 2010, WS conducted 31 technical assistance projects involving Canada goose damage involving 33 participants. WS also distributed 53 leaflets and handouts on goose biology and damage management methods.

WS continued to employ an integrated approach to resolving requests for operational assistance in FY 2010. As part of an integrated approach to resolving threats and damage, WS used vehicles (boats, trucks), firearms, net guns, spotlights, and pyrotechnics to disperse 1,404 geese during FY 2010. As part of direct operational assistance to alleviate damage, WS employed lethal methods to take 113 geese in FY 2010. Firearms were used to lethally take 90 geese. Hand capture and hand nets were employed to live capture 18 geese and one goose, respectively. Net guns were employed to live capture four geese. Geese captured by hand, hand net and net gun were euthanized using carbon dioxide or cervical dislocation. In FY 2010, 18 nests containing 87 eggs were treated or destroyed by WS in Connecticut. Of these, four were destroyed after one or both adults were removed.

WS' Goose Damage Management Activities in Connecticut during FY 2011

During FY 2011, the WS program in Connecticut conducted technical assistance projects relating to Canada goose damage involving 27 people and the distribution of 16 leaflets. WS also continued to provide direct operational assistance during FY 2011, when requested. During direct operational assistance projects, WS employed firearms to lethally 48 geese, hand capture to take two geese, and nets to take one goose during FY 2011. Geese live-captured by hand or using nets were euthanized by cervical dislocation or carbon dioxide. In addition, the WS program employed non-lethal methods to disperse geese during FY 2011. WS employed pyrotechnics to disperse 104 geese, spotlights to disperse 10 geese, and the noise associated with the discharge of a firearm to disperse 212 geese. WS also destroyed two goose nests containing 11 eggs to alleviate damage and disperse geese.

Canada goose population impact analysis from WS' activities

The WS program has received requests for assistance to manage damage and threats to human safety throughout the State, where there are two behaviorally distinct types of Canada goose populations that could be present in the State based on the time of year when those geese are present. Those behaviorally distinct types of geese are classified as either resident geese or migratory geese. Distinguishing between the two types is difficult; therefore, the evaluations in this supplement will distinguish between the two types of geese based on the time of year when those geese were present in the State.

Resident Canada 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, August (see 50 CFR 21.3; Rusch et al. 1995, Ankney 1996, USFWS 2005). During much of the year, the majority of Canada geese present in the State are resident geese, not migratory. Those geese reside in Connecticut throughout the year; however, distinguishing a resident Canada goose and a migratory Canada goose can be difficult.

Resident Canada geese become sexually mature and breed at two to three years of age and have a relatively high nesting success compared to migrant Canada geese (USFWS 2005). Resident Canada geese primarily nest from March through May each year. In Connecticut, resident Canada geese nest in traditional sites (*e.g.*, 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). Nest locations are normally associated with a body of water. These areas provide optimal habitat for Canada geese.

In Connecticut, resident Canada geese molt and are flightless from mid-June through mid-July each year. Molting is the process whereby geese annually replace their primary and secondary flight (wing) feathers

(Welty 1982). Portions of a flock of geese can be flightless from about one week before and two weeks after the primary molt period due to the asynchronous molting by individual birds. Non-breeding resident Canada geese which have failed nesting attempts sometimes move to other areas in late spring prior to molting (Nelson and Oetting 1998).

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

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 outlines the main goals relating to Canada geese in the Atlantic Flyway. The main subject areas covered in the plan as they relate to population management focus 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. 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 called for the maximum 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 annually monitor populations, harvest, and conflict levels to evaluate the effectiveness of the management plan (Atlantic Flyway Council 1999).

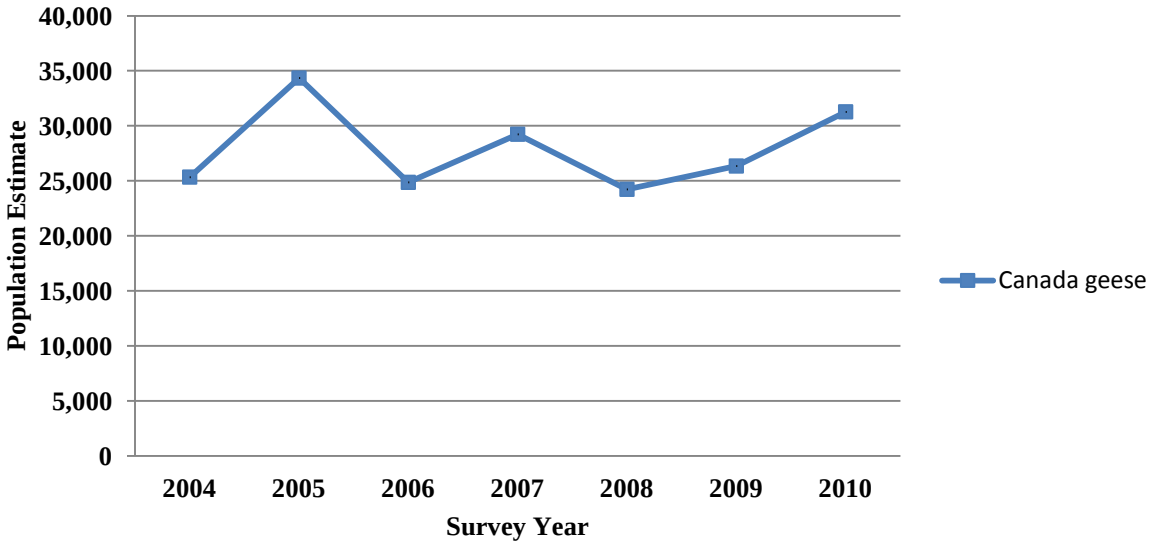
During the development of the EIS evaluating the management of resident Canada goose populations, the USFWS and the States estimated the resident Canada goose population at 3.2 million in the United States; about 30% to 35% above the number States believed to be acceptable based on their needs to manage 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 2011 estimate for the Atlantic Flyway resident Canada goose population was estimated over 1,015,000 (845,600-1,184,600) geese, which was similar to the 2010 estimate (USFWS 2011), but was over 56% above the population objective recommended by the Atlantic Flyway Council in their resident Canada goose management plan (Atlantic Flyway Council 1999). As reported by the BBS, resident breeding populations of Canada geese in Connecticut have increased 10.1% per year from 1966 through 2010 (Sauer et al. 2011). The spring Canada goose population management goal for Connecticut is 15,000 geese (Atlantic Flyway Council 1999, USFWS 2005).

The annual population estimates for resident Canada geese in the State from 2004 through 2010 are shown in Figure 1. In 2004, the resident goose population in the State was estimated at 25,341 geese (Klimstra and Padding 2010). In 2010, the resident goose population was estimated at 31,272 geese in the State (Klimstra and Padding 2010) which exceeds the population goal of 15,000 resident geese by nearly 109%. 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 (Atlantic Flyway Council 1999, USFWS 2005). Under the selected alternative in the resident Canada goose management 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.

As discussed previously, of primary concern when evaluating the potential impacts of damage management activities is the magnitude of take on a species' population from the use of lethal methods. Lethal methods are employed to remove a goose or those geese responsible for causing damage and only after requests for such assistance are received by WS. The use of lethal methods would therefore result in local population reductions in the area where damage or threats were occurring. The number of geese removed from the population using lethal methods under the proposed action would be dependent on the number of requests for assistance received, the number of individuals involved with the associated damage or threat, and the efficacy of methods employed.

Figure 1 - Resident Canada goose population estimate for Connecticut, 2004-2010

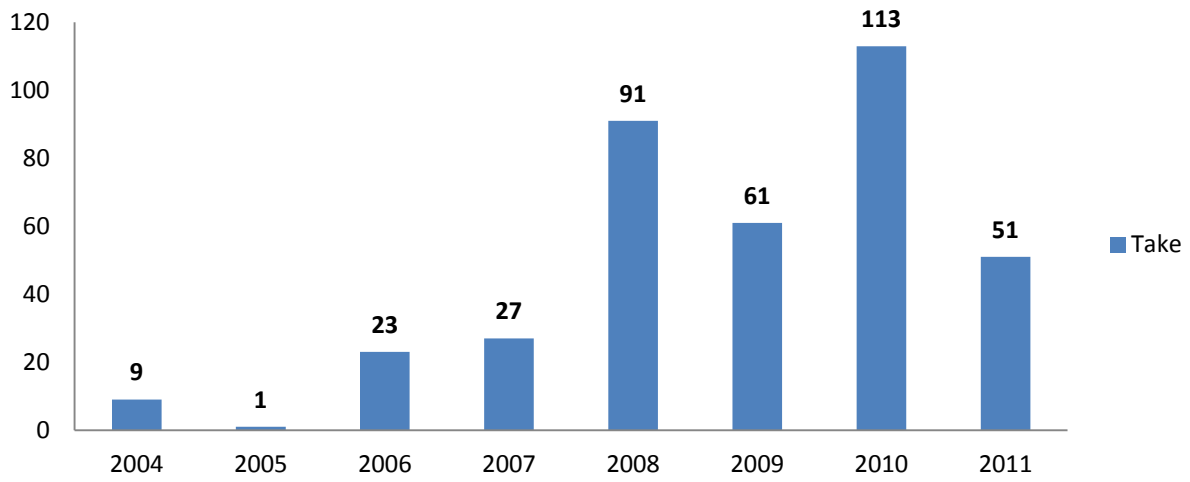


WS' take of Canada geese in Connecticut by year from FY 2004 through FY 2011 are shown in Figure 2. Since FY 2004, a total of 376 Canada geese have been lethally taken by WS in Connecticut to alleviate or prevent damage to a variety of resources at the request of the resource owner. WS' highest take level of geese occurred in FY 2010 when 113 geese were lethally removed to prevent or alleviate damage.

The EA analyzed take by WS of no more than 5% of the estimated resident Canada goose population in Connecticut and no more than 150 migratory Canada geese in the State annually under the proposed action alternative. The number of resident geese in Connecticut was estimated at 31,272 geese during the Atlantic Flyway Breeding Waterfowl Plot Survey conducted in 2010 (Klimstra and Padding 2010). Based on trend information from the BBS, the number of geese observed along routes surveyed during the breeding season is showing an increasing trend in Connecticut (Sauer et al. 2011).

Table 1 shows the estimated spring resident goose population in the State based on the Mid-Atlantic Breeding Waterfowl Survey by survey year along with a comparison of WS' take of geese by fiscal year. 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. Therefore, WS' take will be analyzed here as if all birds taken were resident geese. The take of geese by WS did occur during those periods of time from FY 2004 through FY 2011 when geese present in the State could be geese that are not present in the State throughout the year. Distinguishing resident and migratory Canada geese is not possible through visual identification.

Figure 2 - Resident Canda goose take by WS, FY 2004-FY 2011



However, based on those requests received and the type of damage occurring, those geese addressed by WS from FY 2004 through FY 2011 were likely resident geese (*i.e.*, present in the State all year). As shown in Table 1, if all geese taken by WS are considered resident geese, WS' take of geese has not exceeded the 5% level of the resident population evaluated in the EA; therefore, WS' take of geese has occurred within the scope of analysis in the EA for geese considered resident. The spring population of geese in 2011 was unavailable during the development of this supplement. The highest percentage of take by WS occurred in FY 2008 and FY 2010 when 0.4% of the estimated resident goose population was lethally removed by WS to alleviate damage.

Table 1 – Resident Canada goose population estimates and WS' take in Connecticut.

Year	Resident Population[a,b]	WS' Take[c]	WS % take[d]
2004	25,341	9	**0.036%**
2005	34,341	1	**0.003%**
2006	24,863	23	**0.093%**
2007	29,234	27	**0.092%**
2008	24,230	91	**0.376%**
2009	26,347	61	**0.232%**
2010	31,272	113	**0.361%**

[a]Reported by calendar year, [b]Atlantic Flyway Council 2009, [c]Reported by fiscal year, [d]based on all take by WS being geese considered resident

As discussed previously, the USFWS developed a FEIS to evaluate alternatives to address the increasing resident goose population across the United States and to reduce associated damage (USFWS 2005). In addition, several depredation orders were established to manage damage associated with Canada geese without a depredation permit from the USFWS when certain criteria are occurring. Under 50 CFR 21.49, resident Canada geese can be lethally taken at airports and military airfields without the need for a depredation permit by airport authorities or their agents when those geese are causing damage or posing a threat of damage to aircraft. A Canada goose nest and egg depredation order was also 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 Connecticut, when geese are causing damage to agricultural resources. Canada geese can also be taken to alleviate

threats to public safety under 50 CFR 21.52. Under the depredation orders for Canada geese, no individual federal depredation permit is required to take geese once the criteria of those orders have been met. However, a State permit may still be required to lethally take geese.

The USFWS has also permitted take of Canada geese by entities besides WS through the issuance of depredation permits to alleviate damage or threats of damage (USFWS 2005). Table 2 shows permitted take authorized by the USFWS along with the actual take of geese reported to the USFWS by other non-WS entities, and the number of nests destroyed since the implementation of the Canada goose nest and egg depredation order. The cumulative take of geese from all known sources is shown in Table 3.

As shown in Table 2, the highest lethal take level authorized by USFWS occurred in 2008 when 2,724 geese were authorized to be taken by non-WS entities. In 2009, the USFWS authorized the lethal take of up to 2,524 geese in the State. The highest level of take reported under depredation permits occurred in 2009 when 652 geese were reported taken by non-WS entities. No take data was available from the USFWS for 2010 during the development of this supplement.

Table 2 – Take of Canada geese in Connecticut permitted by the USFWS and the take reported by non-WS permittees under those depredation permits.

Year	Take Permitted	Take Reported	Nests Destroyed[†]
2004	1,536	340	192
2005	2,032	287	171
2006	1,837	413	122
2007	2,297	353	70*
2008	2,724	351	169
2009	2,524	652	345

[†] In FY 2006, the USFWS initiated an online registration program for resident Canada goose nest treatment replacing depredation permits.

[*] Includes nests reported under USFWS Depredation Permits and the online registration program.

WS lethally removed a total of 376 Canada geese in Connecticut from FY 2004 through FY 2011 with the highest level of take occurring in FY 2010. WS' take of 113 geese in FY 2010 represented 0.4% of the estimated statewide population of geese in Connecticut during 2010. Despite WS' take of geese from FY 2004 through FY 2011 in the State, the statewide population of resident geese continues to increase. In 2004 the resident population was estimated at 25,341 geese while the 2010 estimate was 31,272 geese which is an increase of 23%. BBS data is also showing an increasing trend in the breeding population from 2000 through 2010 estimated at 10.0% annually (Sauer et al. 2011).

From 2004 through 2010, a total of 32,900 geese were harvested in the State during the September hunting season intended to target resident populations of Canada geese. The take of 6,600 geese during the September season in 2005 represented 19.2% of the estimated statewide spring population of geese during 2005. Based on a statewide population of 31,272 geese, the take of 2,300 geese during the September season in 2010 represented 7.4% of the estimated population. The cumulative take of geese in 2009, if all geese taken were resident geese, would represent 36.9% of the estimated resident population.

WS' take of geese to alleviate damage since FY 2004 represents 0.3% of the total take of geese that has occurred in the State since 2004. WS' take of geese has been of low magnitude when compared to the statewide population and to the annual harvest of geese in the State. As stated earlier, survey data continues to indicate that resident goose population in the State is generally increasing which provides an indication that harvest, including take to alleviate damage, is not resulting in adverse effects to the statewide resident Canada goose population. WS' take of geese to alleviate damage has been a minor component of the total number of geese taken in the Sate during the regulated harvest season and the take

of geese under depredation permits or depredation orders. The resident goose population goal for Connecticut is 15,000 geese (Atlantic Flyway Council 1999, USFWS 2005). The 2010 resident goose population in the State was estimated at 31,272 geese which exceeds the population goal by nearly 109%.

Table 3 – Cumulative Take of Canada Geese in Connecticut, 2004-2011

Year	WS' Take[1]	Hunter Harvest[2]			Depredation Take[3]	Total Take
		Regular	Late	September		
2004	9	14,300	800	5,300	340	**20,749**
2005	1	13,700	600	6,600	287	**21,188**
2006	23	7,400	700	5,900	413	**14,436**
2007	27	13,400	1,400	3,700	353	**18,880**
2008	91	16,500	0	6,400	351	**23,342**
2009	61	6,300	0	2,700	652	**9,713**
2010	113	6,500	0	2,300	N/A*	**8,913**
2011	51	N/A	N/A	N/A	N/A	N/A
TOTAL	**376**	**78,100**	**3,500**	**32,900**	**2,396**	**117,221**

[1]WS' take is reported by federal fiscal year
[2]Regular Season (October to January); Late Season (January to February); September Season
[3]Data reported by calendar year
*Data is currently unavailable

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. From FY 2004 through FY 2011, WS removed or destroyed a total of 37 Canada goose nests containing 172 eggs. Impacts due to nest and egg removal and destruction would have little adverse impact on the resident goose population in Connecticut. Nest and egg destruction methods are 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 has no long term effect on breeding adult geese when limited and localized activities are conducted. Nest and egg removal is not used by WS as a population management method. This method is used by WS to inhibit nesting in an area experiencing damage due to the nesting activity and is employed only at the localized level. Treatment of 95% of all Canada goose eggs each year would result in only a 25% reduction in the population over 10 years (Allan et al. 1995). 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).

Migratory Canada Geese

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. Most authorities currently recognize 11 subspecies of Canada geese, which differ primarily in body size and color (Bellrose 1980). Canada goose migrations may encompass up to 3,000 miles, like that of the Richardson's Canada goose (*B.c. hutchinsii*) which nests as far north as Baffin Island, Nunavut, Canada and winters as far south as the eastern States of Mexico. Migrant geese nest across the arctic, subarctic, and boreal regions of Canada and Alaska and range in size from the 2 to 4 pound cackling Canada goose (*B.c. minima*) to the 7 to 10 pound dusky Canada goose (*B.c. occidentalis*).

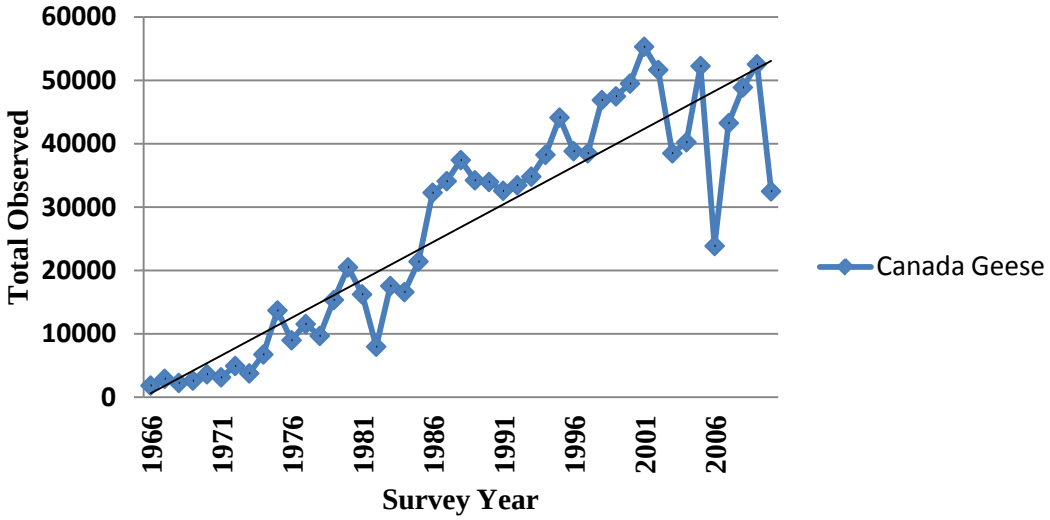
In the Atlantic Flyway, migratory Canada geese consist primarily of three distinct populations. Those populations include the North Atlantic Population (NAP), Atlantic Population (AP), and the Southern

James Bay Population (SJBP) (USFWS 2011). As shown in Figure 3, the number of Canada geese observed in the State during the CBC has shown an overall increasing trend since 1966 (NAS 2010).

In 2011, the number of breeding pairs of geese for the AP was estimated to be 194,400 pairs, 27% higher than the 2010 estimate (USFWS 2011). The total spring population of AP geese was estimated at 919,300 geese (USFWS 2011). In 2011, there were an estimated 48,500 indicated pairs (singles plus pairs) of geese in the NAP, 11% fewer than the 2010 estimate. Indicated pair estimates have declined an average of 3% per year since 2002 (USFWS 2011). The total NAP goose population was estimated at 152,800 geese in 2011 which was similar to the 2010 estimate (USFWS 2011). The number of breeding geese in the SJBP was estimated to be 86,900 geese during the spring 2011 survey which was 30% higher than the 2010 estimate. Surveys of the SJBP have shown an increasing trend estimated at an average of 3% per year since 2002 (USFWS 2011).

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 in the State 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 would be considered as migratory geese, despite the possibility that some or all could actually be resident geese (*i.e.*, present in the State throughout the year).

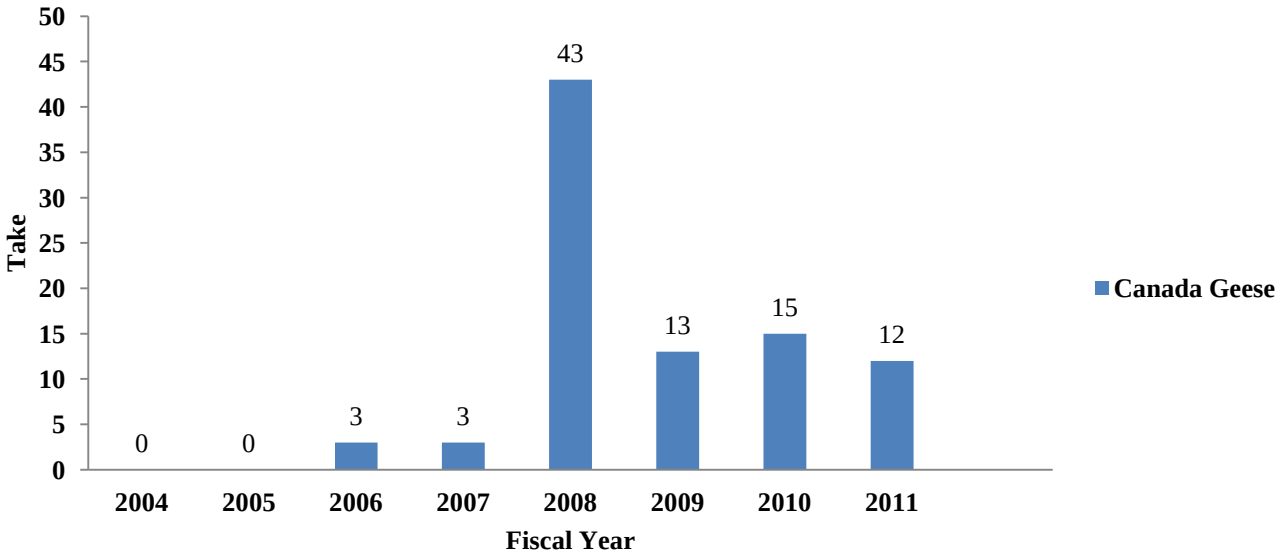
Figure 3 - National Audubon Society Christmas Bird Count Data for Connecticut, 1966-2010



Based on prior requests for assistance, the EA evaluated an annual take of up to 150 geese during those months when geese are considered migratory in the State. WS' take of Canada geese during the time period when geese in the State could have been migratory is shown in Figure 4. The geese reported taken in Figure 4 as possibly being of the migratory goose population were removed from flocks of known resident geese in urban areas and as such were most likely not part of the migratory goose population. However, WS' take of geese during those months when geese are present in the State and are considered migratory did not exceed 150 birds annually. The highest level of take by WS occurred in FY 2008 when 43 geese were taken to alleviate damage or threats of damage when migratory geese could have been present in the State. WS' take of migratory geese from FY 2004 through FY 2011 was within the scope analyzed in the EA (USDA 2004).

As shown in Figure 4, a total of 89 geese were taken by WS during those months when geese present in the State could be considered migratory which is an average of 12 geese taken annually that could be migratory geese. The actual number of migratory geese taken by WS and from which population segments those geese were taken 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 Connecticut relates to the protection of human health and safety at airports. Canada goose damage management at those facilities is conducted throughout the year whenever a threat arises, and although non-lethal means are primarily used to reduce threats from Canada geese, lethal methods are sometimes employed.

Figure 4 – Migrant Canada Goose take by WS from FY 2004 through FY 2011



Frameworks have been established by the USFWS and implemented by the CDEP to allow for the harvest of geese during those months when geese 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. In 2009, an estimated 6,300 geese were taken during the regular and late hunting seasons for geese in the State (Raftovich et al. 2011). An estimated 6,500 geese were harvested in both seasons during the 2010 season (Raftovich et al. 2011).

Hunter harvest data for Canada geese for the regular season, late season, and September season from 2004 through 2010 can be found in Table 3 along with the reported take from depredation permits issued by the USFWS for the take of Canada geese to alleviate or prevent damage. As shown in Table 3, WS' annual total take of geese has ranged from a low of 0.01% to a high of 1.3% of the total annual known goose take in the State. WS' take of Canada geese from 2004 through 2010 has been 0.3% of the total harvest of geese in the State.

All take of geese by WS occurs through the issuance of a depredation permit issued by the USFWS which is reported annually to the USFWS and the CDEP. All take of geese during the hunting seasons occur under frameworks established by the USFWS. Take by other entities in the State occurs under depredation permits or depredation orders established by the USFWS with the requirement that take be reported to the USFWS. The actual number of geese taken by all entities 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 are 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 Connecticut is believed to be relatively low annually. The majority of WS' lethal Canada goose damage management activities have taken place during the months when migratory geese are not present in Connecticut (*i.e.*, from April through August). Most, if not all of WS' Canada goose damage management activities, are targeted towards the resident Canada goose population.

As shown in Table 3, a total of 114,500 geese have been harvested from 2004 through 2010 during the September season, regular waterfowl season, and the late season in the State when those geese present in the State could be considered migratory. WS' take of 89 geese that could be migratory would represent 0.1% of the total geese taken during the regular waterfowl season in the State from 2004 through 2010.

During the CBC conducted in 2010, observers counted 32,504 geese in the State (NAS 2010). CBC data compiled since the 2001 survey conducted in the State, indicates an average of 43,907 geese have been observed during the CBC conducted annually. WS' average annual lethal take of 12 geese from FY 2004 through FY 2011 that could be considered as part of the migratory Canada goose population would represent 0.03% of the average number of geese observed annually in the State during the CBC conducted since 2001. WS' total lethal take of 89 geese from FY 2004 to FY 2011 that could be considered as part of the migratory Canada goose population would represent 0.2% of the average number of geese observed annually in the State during the CBC conducted since 2001. Between the surveys conducted during the CBC from 2001 through 2010, the fewest number of geese counted was 23,888 geese observed in 2006 while the highest number recorded was 55,306 geese in 2001. WS' total lethal take of 89 migratory geese from FY 2004 through FY 2011 would range from 0.2% to 0.4% of the geese observed during those years.

CBC data is best interpreted as an indication of long-term trends in the number of birds observed wintering in the State and is not intended to represent population estimates of wintering bird populations. However, the information is presented in this analysis and compared to WS' take to indicate the low magnitude of take that occurred by WS when compared to the number of geese observed in the State during the CBC which would be considered a minimum population estimate given the survey parameters of the CBC and the survey only covering a small portion of the State.

The EA concluded that WS' Canada goose damage management activities in Connecticut would have no cumulative adverse effects on the populations of Canada geese in Connecticut or the Atlantic Flyway. WS' lethal take of Canada geese was within the estimated level of take analyzed in the EA. WS' damage management activities were site specific, and although local populations of geese were reduced or dispersed, there was no probable adverse impact on statewide or Atlantic Flyway populations of geese from WS' activities. Program activities and their potential impact on Canada geese have not changed from those analyzed in the EA. Based upon the information provided above, WS' management actions would have no adverse effect on resident or migratory goose populations.

Issue 2 - Effectiveness of Canada Goose Damage Management

The effectiveness of any damage management program could be defined in terms of losses or risks potentially reduced or prevented, how accurately practitioner's diagnosis the problem, the species responsible for the damage, and how actions are implemented to correct or mitigate risks or damages. To determine that effectiveness, WS must be able to complete management actions expeditiously to minimize harm to non-target animals and the environment, while at the same time, using methods as humanely as possible. The most effective approach to resolving any damage problem is to use an adaptive integrated approach which may call for the use of several management methods simultaneously or sequentially (USDA 1997, 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[1]. 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 is to reduce damage, risks, and conflicts with wildlife as requested and not to necessarily reduce/eliminate populations. Localized population reduction could be short-term and new individuals may immigrate, 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 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.

WS evaluated the effectiveness of methods available under each of the alternatives in the EA. The analyses in the EA indicated the proposed action would allow for the most effective use of methods by allowing for the employment of those methods individually or in combination to achieve the effectiveness desired by the requestor. The proposed action in the EA addressed the integration of methods to reduce habituation, to increase the effectiveness of individual methods, to maximize effectiveness collectively of methods, and to allow for the successful reduction or prevention of damage.

The other alternatives restrict the methods available for use which further reduces the effectiveness of individual methods and prevents the use of methods that could be effective in reducing or preventing damage. By allowing an integration of non-lethal and lethal methods under the proposed action, those methods most effective to prevent or reduce damage are available. The proposed action also allows for the adaption of methods to the damage situation where types of methods are employed but are not successful at reducing or preventing damage. For example, allowing for an adaptive integrated approach to managing damage provides opportunities to evaluate methods after employment to determine effectiveness and to employ additional methods if a reduction in damage is not adequate for the requestor.

The EA further indicates that the objective of all methods is to reduce damage or prevent damage from occurring. All methods addressed in the EA are intended to exclude geese from an area where damage is occurring or could occur, to disperse or remove geese causing damage, or to otherwise make the area where damage is occurring unattractive through modification of habitat. Therefore, effectiveness can be defined by the amount of time required to achieve the desired result and the duration for which the desired result is maintained once methods are no longer employed or maintained. The proposed action allows for the use of the widest range of methods to allow for the most effective methods to be employed to achieve the desired results in a timely manner and for the longest duration.

WS' assistance has been provided in a timely manner to all requestors. Potential impacts on the effectiveness of wildlife damage management have not changed from those analyzed in the EA. Impacts of the proposed action alternative on this issue are expected to remain insignificant.

Issue 3 - Effects on Aesthetic Values

As analyzed in the EA, WS would employ methods when requested that would result in the dispersal, exclusion, or removal of individuals or small groups of geese to resolve damage and threats. In some

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

instances where geese are dispersed or removed, the ability of interested persons to observe and enjoy those geese would likely decline temporarily. The presence of geese in areas where geese were dispersed would likely increase upon cessation of damage management activities.

Even the use of exclusionary devices can lead to the dispersal of geese if the resource being damaged was acting as an attractant. Thus, once the attractant has been removed or made unavailable, geese 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 and dispersal of those geese responsible for causing damage that resulted in a request for assistance. WS' goal is to respond to requests for assistance and to manage only those geese responsible for the resulting damage. Therefore, the removal of geese would result in localized declines. However, the overall populations of geese would not be impacted. BBS data continues to indicate that populations of resident Canada geese in Connecticut are increasing and the number of geese observed in the State during the CBC has also shown increasing trends. Based on the potential for a localized decline in the presence of geese, the EA concluded the effects on aesthetics would be variable depending on the stakeholders' values towards wildlife. However, the ability to view and enjoy geese in Connecticut would still remain if a reasonable effort is made to locate geese outside the area in which damage management activities occurred.

Conflicts with Canada geese were reduced at each location that WS provided direct management assistance; thereby, improving the aesthetic values of affected properties. Program activities and methods and their potential impacts on aesthetics have not changed from those analyzed in the EA.

Issue 4 - Humaneness and Animal Welfare Concerns of Methods Used by WS

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

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, the analyses must consider the most effective way to address damage and threats caused by wildlife in a humane manner. WS is challenged with conducting activities and employing methods that are perceived to be humane while assisting those persons requesting assistance to manage damage and threats associated with wildlife. The goal of WS is to use methods as humanely as possible to effectively resolve requests for assistance to reduce damage and threats to human safety. WS continues to evaluate methods and activities to minimize the potential pain and suffering of those methods when attempting to resolve requests for assistance.

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

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

The EA concluded that the methods used by WS to manage Canada goose damage are relatively humane, but that some persons would view some methods used as inhumane. Those methods addressed in Appendix B of the EA are still available for use under the alternatives and no additional methods have been identified that would change the analyses in the EA.

Issue 5 - Effects on Non-target Wildlife Species Populations, Including T&E Species

The issue of non-target species effects, including effects on threatened and endangered (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. SOPs are designed to reduce the effects of goose damage management activities on non-target species' populations. To reduce the risks of adverse effects to non-target wildlife, WS selects damage management methods that are as target-selective as possible or applies such methods in ways that reduces the likelihood of capturing non-target species. Before initiating management activities, WS also selects locations which are extensively used by the target species and employs baits or lures which are preferred by those species, when applicable. Despite WS' best efforts to minimize non-target take during program activities, the potential for adverse effects to non-targets exists when applying both non-lethal and lethal methods to manage damage or reduce threats to safety.

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

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

While every precaution is taken to safeguard against taking non-targets during operational use of methods and techniques for resolving damage and reducing threats caused by wildlife, the use of such methods can result in the incidental take of unintended species. Those occurrences are minimal and should not affect the overall populations of any species. WS' take of non-target species during activities to reduce damage or threats to human safety caused by geese is expected to be extremely low to non-existent. WS would continue to monitor the take of non-target species to ensure program activities or methodologies used in goose damage management do not adversely impact non-targets. WS' activities are not likely to adversely affect the viability of any wildlife populations from damage management activities.

No non-target species of wildlife were taken by WS in Connecticut during direct goose management assistance from FY 2004 through FY 2011. No negative effects on non-target wildlife species populations or their habitats have been identified.

Threatened & Endangered Species: A review of T&E species listed by the USFWS and the National Marine Fisheries Service showed that additional listings of T&E species in Connecticut have occurred since the completion of the EA in 2004 (see Appendix A). Those species listed since the completion of the EA include the American burying beetle (*Nicroporus americanus*), Indiana bat (*Myotis sodalis*), and American chaffseed (*Schwalbea americana*). The American burying beetle and the American chaffseed are listed in Connecticut, but are not known to currently occur in the State. Based on the absence of those species from the State, WS has determined that goose damage management activities described in the EA and this supplement would have no effect on those species. The Indiana bat is listed as endangered and is known to occur in the State but is not currently listed in the State. A review of methods and activities that could be conducted under the proposed action, WS has determined that activities conducted pursuant to the proposed action would have no effect on the Indiana bat.

In addition, the red knot (*Calidris canutus rufa*) and the New England cottontail rabbit (*Sylvilagus transitionalis*) are candidate species for listing in the State. Red knots are long distance migrants that pass through Connecticut during spring and fall migration periods. During their migrations, red knots are found primarily in marine and estuarine habitats (Harrington 2001). Based on requests for assistance received previously by WS in Connecticut, the habitat in which red knots are found, and the limited time red knots are present in the State, WS has determined that the proposed action in the EA would have no effect on red knots if listing occurs.

The New England cottontail rabbit once occurred statewide in Connecticut but currently only occupies suitable habitat in the western and southeastern portions of the State (see citations in USFWS 2009). New England cottontails are considered habitat specialists that require small scale disturbances that delay the forest succession associated with forest regeneration as well as shrub lands associated with sandy soils or wetlands (USFWS 2009). New England cottontails require thick, dense cover with populations declining once under stories thin during the process of stand maturation (Litvaitis 2001). New England cottontail rabbits are most commonly found in habitats associated with beaver flowage wetlands, idle agricultural lands, power line corridors, coastal barrens, railroad rights-of way, and patches of regenerating forest (Litvaitis 1993, Tash and Litvaitis 2007). WS has reviewed the methods available under the proposed action in the EA and based on the limited distribution and the habitat requirements of New England cottontail rabbits, WS has determined that the proposed action would have no effect on the cottontail rabbit. Although limited habitat modification is discussed in the EA as a methods that could be recommended or employed by WS to manage damage associated with Canada geese, the recommendation or the use of habitat modification would occur on a small scale in localized areas where damage was occurring. WS does not advocate large-scale habitat modification to achieve wildlife damage management objectives. Therefore, WS' activities would have no effect on the New England cottontail rabbit if listed in the State.

Program activities and their potential impacts on non-target wildlife species, including T&E species have not changed from those analyzed in the EA. Impacts on non-target wildlife species, including T&E species populations are expected to remain insignificant.

The current list of Connecticut endangered, threatened, and special concern species became effective in July 2010. Connecticut's Endangered, Threatened and Special Concern Species list (CDEP 2010*a*) and a summary of the changes can be found on the CDEP website (CDEP 2010*b*). WS has reviewed the new species added to the list. This consists of one bird species, one reptile species, two fish species, 16 invertebrate species, and three plant species. Based on requests for assistance received previously by WS in Connecticut and proposed WS' activities to manage Canada geese, WS has determined that the proposed action in the EA would have no effect on newly listed species. If it is determined that state listed species are in an area where Canada goose management activities are being conducted and could be

impacted by WS activities, WS would consult with CDEP to minimize or eliminate threats to listed species.

XVII. CUMULATIVE IMPACTS

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

WS would be the primary federal program with damage management responsibilities; however, other entities may conduct similar activities in State as permitted by the USFWS and the CDEP. Through ongoing coordination with the USFWS and the CDEP, WS is aware of such activities and may provide technical assistance in such efforts. WS does not normally conduct direct damage management activities concurrently with other entities in the same area, but may conduct activities at adjacent sites within the same timeframe. The potential cumulative impacts analyzed below could occur either as a result of WS' program activities over time or as a result of the aggregate effects of those activities combined with the activities of other agencies and individuals.

Chapter 4 of the EA provides further information and analyses on potential cumulative impacts of the proposed action. The following resource values in the State are not expected to be significantly impacted by any of the alternatives analyzed: soils, geology, minerals, water quality/quantity, flood plains, wetlands, critical habitats (areas listed in T&E species recovery plans), visual resources, air quality, prime and unique farmlands, aquatic resources, timber, and range. These resources will not be analyzed further. The activities proposed in the alternatives would have a negligible effect on atmospheric conditions including the global climate. Meaningful direct or indirect emissions of greenhouse gases would not occur as a result of any of the proposed alternatives. Those alternatives would meet the requirements of applicable laws, regulations, and Executive Orders including the Clean Air Act and Executive Order 13514.

Issue 1 - Effects on Target Canada Goose Populations

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

- Natural mortality of geese
- Mortality of geese from vehicle collisions, aircraft strikes, and illegal take
- Human-induced mortality of geese through private damage management activities
- Human-induced mortality during the regulated hunting season
- Human and naturally induced alterations of wildlife habitat
- Annual and perennial cycles in population densities

All those factors play a role in the dynamics of Canada goose populations. In many circumstances, requests for assistance arise when some or all of those elements have contrived to elevate goose populations or place target species at a juncture to cause damage to resources. WS' actions taken to minimize or eliminate damage are constrained as to scope, duration and intensity, for the purpose of reducing or avoiding impacts to the environment. WS evaluates damage occurring, including other affected elements and the dynamics of the damaging species; determines appropriate strategies to reduce effects on environmental elements; applies damage management actions; and subsequently monitors and

adjusts/ceases damage management actions (Slate et al. 1992, USDA 1997, USDA 2004). This process allows WS to take into consideration other influences in the environment, such as those listed above, in order to avoid cumulative adverse impacts on target species.

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

Historical outcomes of WS' activities to address Canada goose damage in the State

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

With management authority over Canada geese in Connecticut, the USFWS and the CDEP can adjust take levels, including the take of WS, to ensure population objectives for geese are achieved. Consultation and reporting of take by WS would ensure the USFWS and the CDEP considers any activities conducted by WS.

Since the completion of the EA, the breeding population of Canada geese in the State continues to show an increasing trend which provides some indication that WS' activities are not cumulatively impacting populations. From FY 2004 through FY 2011, 376 geese have been taken by WS since the completion of the EA to alleviate damage or reduce threats in the State. From 2004 through 2010, hunters have harvested an estimated 114,500 geese during the regulated hunting season in the State. In addition, geese may be taken to alleviate damage and threats of damage. A total of 2,396 geese have been lethally taken in the State from 2004 through 2009 under depredation permits issued by the USFWS and the CDEP. WS' annual take of geese has averaged 0.3% of the reported annual harvest of geese in the State with the highest level occurring in FY 2010 which represented 1.3% of the reported harvest. In addition, the estimated breeding population in the State currently exceeds the statewide management goal established for geese.

WS' take has been and would continue to be a small component of the overall harvest of geese which is monitored and adjusted by the USFWS and the CDEP to meet management objectives for goose populations in the State. Canada goose populations in the State continue to remain at least stable which provides an indication that the cumulative take of geese has not reached a level where an undesirable decline in the goose population has occurred. WS' reporting of take to the USFWS and the CDEP ensures fluctuations in the goose population across the State occurs with the knowledge of the USFWS and the CDEP and is considered when setting allowable take levels for geese to meet objectives. WS' activities are conducted on a small portion of the land area of the State and although local declines in the goose population could occur from WS' activities, those activities would not reach a level where goose populations would be adversely affected from those actions.

SOPs built into WS' program

SOPs are designed to reduce the potential negative effects of WS' actions on goose populations, and are tailored to respond to changes in goose populations which could result from unforeseen environmental changes. This would include those changes occurring from sources other than WS. Alterations in

program activities are defined through SOPs and implementation is insured through monitoring, in accordance with WS' Decision Model (Slate et al. 1992, USDA 1997, USDA 2004).

Issue 2 - Effectiveness of Canada Goose Damage Management

As discussed in Chapter 2 of the EA and discussed previously in this supplement to the EA, 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 practitioners diagnosis 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 (USDA 1997, 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 are unsuccessful, but that periodic management may be necessary.

Correlated with the effectiveness of methods at reducing or alleviating damage are 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 bird 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 beaches 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. Also, it is rarely possible to conclusively prove that waterfowl are responsible for individual disease cases or outbreaks which were discussed in Chapter 1 of the EA and this supplement.

As part of an integrated approach to managing Canada goose damage, WS would have the ability to adapt methods to damage situations to effectively reduce or prevent damage from occurring. Under the proposed action alternative, 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 would be to reduce damage and threats to human safety or to prevent damage from occurring using an integrated approach to managing goose damage. Therefore, under the proposed action, WS would employ methods adaptively to achieve that objective.

Concern is often raised that geese 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, the use of non-lethal methods is also often temporary which could result in geese returning to an area where damage was occurring once those methods are no longer used. Geese would return if suitable habitat continues to exist at the location where damage was occurring and goose 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 geese from areas would only be temporary if habitat continues to exist. Dispersing geese using pyrotechnics, repellents, dogs, or any other non-lethal method addressed in the EA often requires repeated application to discourage geese which increases costs, moves geese to other areas where they could cause damage, and are temporary if habitat conditions remain unchanged. Dispersing and the translocation of geese could be viewed as moving problem geese from one area to another which would require addressing damage caused by those geese at another location. WS' recommendation of or use of techniques to modify existing habitat or making areas unattractive to geese was addressed in the EA. Therefore, WS' objective is to respond to request for assistance with the most effective methods and to provide for the long-term solution to the problem using WS' Decision Model to adapt methods in an integrated approach to managing goose damage that are agreed upon by the cooperator. WS' legislative authority to manage wildlife damage was also addressed in the EA.

In regards to the effectiveness of methods used, Avery (2002) cited studies where lethal damage management reduced losses to crops (Elliott 1964, Larsen and Mott 1970, Palmer 1970, Plesser et al. 1983, Tahon 1980, Glahn et al. 2000 as cited in Avery 2002) and those lethal methods posed little danger to non-target species (Glahn et al. 2000). Avery (2002) also stated that it seems reasonable that local, short-term crop protection can 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) stated that studies demonstrating economic benefit from the use of lethal methods are lacking but did not state that lethal methods to resolve damage are not economically effective. Many publications indicate that the use of non-lethal methods require repeated application to achieve the desired result (see Smith et al. 1999, Gorenzel et al. 2000, Gorenzel et al. 2002, Avery et al. 2008, Chipman et al. 2008). Long-term solutions to resolving bird damage often require management of the population (Smith et al. 1999) and identifying the habitat characteristics which attract birds to a particular location (Gorenzel and Salmon 1995).

Issue 3 - Effects on Aesthetic Values

The activities of the cooperating agencies would result in the removal of geese from those areas where damage or threats were occurring. Therefore, the aesthetic value of geese 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 goose densities, including the return of native wildlife and plant species that may be suppressed or displaced by high goose densities.

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 geese 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 geese.

Canada goose population objectives are established and enforced by the USFWS and the CDEP through the regulating of goose take during the statewide hunting season and through the issuance of depredation permits after consideration of other known mortality factors. Therefore, WS has no direct impact on the status of the Canada goose population since all take by WS occurs at the discretion of the USFWS and the CDEP. Since those persons seeking assistance could remove geese from areas where damage is occurring through depredation permits issued by the USFWS and the CDEP or pursuant to depredation orders, WS' involvement would have no effect of the aesthetic value of geese in the area where damage was occurring. When a depredation permit has been issued by the USFWS and the CDEP to a property owner and/or manager that is experiencing damage caused by geese or when geese are removed pursuant to the

depredation orders, the removal of geese under those permits or under the depredation orders would likely occur whether WS was involved with taking the geese 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 and a permit has been issued by the USFWS and the CDEP who are responsible for regulating a resident wildlife species, like geese.

Issue 4 - Humaneness and Animal Welfare Concerns of Methods Used by WS

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.

Methods involving the use of live-capture devices, chemicals, and euthanasia methods occur while WS' personnel are present on the site 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 geese would be applied according to American Veterinary Medical Association 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 geese 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 geese in the State, the cumulative impacts on the issue of method humaneness are minimal. All methods would be evaluated annually to ensure SOPs are adequate to ensure those methods continue to be used to minimize suffering and that wildlife captured are addressed in a timely manner to minimize distress.

Issue 5 - Effects on Non-target Wildlife Species Populations, Including T&E Species

Potential effects on non-target species from conducting goose 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 geese 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 are often expensive and require constant maintenance 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 dispersion methods are generally temporary with non-target species returning after the cessation of those activities. Dispersal and harassment do not involve the take (killing) of non-target species and similar to exclusionary methods are not used to the extent or at a constant level that would prevent non-targets from accessing critical resources that would threaten survival of a population.

The use of lethal methods or those methods used to live-capture target species that are subsequently euthanized also have the potential to impact non-target wildlife through the take (killing) or capture of

non-target species. Capture methods used are often methods that are set to confine or restrain target wildlife after being triggered by the applicator. 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 of the EA are methods that are employed to confine or restrain wildlife that are subsequently euthanized using humane methods since translocation is currently not allowed by the CDEP without a permit. 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. Therefore, the use of those methods would not impact non-target species.

Chemical methods available for use under the proposed action are repellents and alpha-chloralose which are described in Appendix B of the EA. All chemicals would be used according to product labels 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 are 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 to WS and Department of Transportation 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 impacts on non-targets.

All label requirements of those chemical methods would be followed to minimize non-target hazards. As required by the label for alpha chloralose, an acclimation period occurs and sites are monitored for non-target use as outlined in the label. Once sites are baited, applicators are present on site until all bait is consumed. If birds are observed feeding on bait, those sites are abandoned. All unconsumed bait must be retrieved after application.

Repellents may also be used or recommended by the WS program in Connecticut to manage goose damage. The active ingredient in numerous commercial repellents is methyl anthranilate which has been categorized by the EPA as "*generally recognized as safe*". Methyl anthranilate 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 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 Connecticut when used according to label requirements.

The methods described in Appendix B of the EA all have a high level of selectivity and can be employed using SOPs to ensure minimal impacts to non-targets species. No non-targets were taken by WS during Canada goose damage management activities from FY 2004 through FY 2011. Based on the methods available to resolve goose damage and/or threats, WS does not anticipate the number of non-targets taken to reach a magnitude where declines in those species' populations would occur. Therefore, take under the proposed action of non-targets would not cumulatively impact non-target species. WS' has reviewed the T&E species listed by the CDEP and the USFWS and has determined that Canada goose damage management activities proposed by WS would have no effect on T&E species listed in the State. Cumulative impacts would be minimal on non-targets from any of the alternatives discussed.

XVIII. LITERATURE CITED

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Appendix A
Federal Threatened and Endangered Species
Listings and occurrences for Connecticut

Listings and occurrences for Connecticut

Notes:

- This report shows the listed species associated in some way with this state.
- This list does not include experimental populations and similarity of appearance listings.
- This list includes non-nesting sea turtles and whales in State/Territory coastal waters.
- This list includes species or populations under the sole jurisdiction of the National Marine Fisheries Service.

Summary of Animals listings

Animal species listed in this state and that occur in this state

Status	Species
T	Plover, piping except Great Lakes watershed (*Charadrius melodus*)
T	Sea turtle, green except where endangered (*Chelonia mydas*)
E	Sea turtle, hawksbill (*Eretmochelys imbricata*)
E	Sea turtle, Kemp's ridley (*Lepidochelys kempii*)
E	Sea turtle, leatherback (*Dermochelys coriacea*)
T	Sea turtle, loggerhead (*Caretta caretta*)
E	Sturgeon, shortnose (*Acipenser brevirostrum*)
E	Tern, roseate northeast U.S. nesting pop. (*Sterna dougallii dougallii*)
T	Tiger beetle, northeastern beach (*Cicindela dorsalis dorsalis*)
T	Tiger beetle, Puritan (*Cicindela puritana*)
T	Turtle, bog (=Muhlenberg) northern (*Clemmys muhlenbergii*)
E	Wedgemussel, dwarf (*Alasmidonta heterodon*)
E	Whale, finback (*Balaenoptera physalus*)
E	Whale, North Atlantic Right (*Eubalaena glacialis*)

Animal species listed in this state that do not occur in this state

Status	Species
E	Beetle, American burying (*Nicrophorus americanus*)
E	Puma (=cougar), eastern (*Puma* (=*Felis*) *concolor couguar*)
E	Wolf, gray (*Canis lupus*)

Animal listed species occurring in this state that are not listed in this state

Status	Species
E	Bat, Indiana (*Myotis sodalis*)

Summary of Plant listings

Plant species listed in this state and that occur in this state (2 species)

Status	Species
E	Gerardia, sandplain (*Agalinis acuta*)
T	Pogonia, small whorled (*Isotria medeoloides*)

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

Status	Species
E	Chaffseed, American (*Schwalbea americana*)