ENVIRONMENTAL ASSESSMENT

MANAGING WATERFOWL DAMAGE IN THE COMMONWEALTH OF VIRGINIA

Prepared by:

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

In Cooperation with:

United States Department of Interior
United States Fish and Wildlife Service

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ACRONYMS

AC	Alpha Chloralose
AI	Avian Influenza
AP	Atlantic Population
APHIS	Animal and Plant Health Inspection Service
AVMA	American Veterinary Medical Association
BBS	Breeding Bird Survey
BO	Biological Opinion
CBC	Christmas Bird Count
CDC	Centers for Disease Control
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
DEQ	Department of Environmental Quality
DNC	4,4'-dinitrocarbanilide
DVE	Duck Virus Enteritis
EA	Environmental Assessment
EPA	U.S. Environmental Protection Agency
EIS	Environmental Impact Statement
ESA	Endangered Species Act of 1973
FAA	Federal Aviation Administration
FDA	U.S. Food and Drug Administration
FEIS	Final Environmental Impact Statement
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FR	Federal Register
FY	Federal Fiscal Year
HDP	4,6-dimethyl-2-pyrimidinol
HP	Highly Pathogenic
INAD	Investigational New Animal Drug
IWDM	Integrated Wildlife Damage Management
MA	Methyl Anthranilate
MBTA	Migratory Bird Treaty Act
MOU	Memorandum of Understanding
N	Nitrogen
NAP	North Atlantic Population
NCZ	Nicarbazin
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NWRC	National Wildlife Research Center
P	Phosphorus
ROD	Record of Decision
SJBP	Southern James Bay Population
SOP	Standard Operating Procedures
T&E	Threatened and Endangered
USAF	U.S. Air Force
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	United States Geological Survey
VAC	Virginia Administrative Code
VDACS	Virginia Department of Agriculture and Consumer Services
VDGIF	Virginia Department of Game and Inland Fisheries
WS	Wildlife Services

CHAPTER 1: PURPOSE AND NEED FOR ACTION

1.1 PURPOSE

The United States Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), Wildlife Services (WS)[1] program in the Commonwealth of Virginia continues to receive requests for assistance to resolve or prevent damage occurring to agricultural resources, natural resources, property, and threats to human safety associated with waterfowl (USDA 1999). Normally, individual wildlife damage management actions conducted by the WS program could be categorically excluded from further analysis under the National Environmental Policy Act (NEPA), in accordance with APHIS implementing regulations for the NEPA (7 CFR 372.5(c), 60 FR 6000-6003).

WS is preparing this Environmental Assessment (EA) to: 1) facilitate planning, 2) promote interagency coordination, 3) streamline program management, 4) clearly communicate to the public the analysis of individual and cumulative impacts of program activities; and 5) evaluate and determine if there are any potentially significant or cumulative adverse affects from the proposed program. The analyses contained in the EA are based on information derived from WS' Management Information System and published documents (Appendix A), including the analyses in WS' programmatic Final Environmental Impact Statement (FEIS) (USDA 1997), the FEIS completed by the United States Fish and Wildlife Service (USFWS) for the management of resident Canada geese (USFWS 2005), the FEIS completed by the USFWS for the management of light geese (USFWS 2007), and the EA previously prepared by WS to address Canada goose and urban waterfowl damage in the Commonwealth (USDA 1999).

Under the proposed action, WS would respond to requests for assistance to resolve and prevent waterfowl damage and threats on federal, Commonwealth, municipal, and private lands in the Commonwealth. Waterfowl species specifically addressed in this EA include Canada geese (*Branta canadensis*), snow geese (*Chen caerulescens*), mallards (*Anas platyrhynchos*), mute swans (*Cygnus olor*), and domesticated waterfowl. Other species considered in this EA that may be taken in limited numbers to resolve and prevent damage and threats in the Commonwealth include ruddy duck (*Oxyura jamaicensis*), wood duck (*Aix sponsa*), ring-necked duck (*Aythya collaris*), American black duck (*Anas rubripes*), redhead (*Aythya americana*), gadwall (*Anas strepera*), green-winged teal (*Anas crecca*), blue-winged teal (*Anas discors*), American wigeon (*Anas americana*), Northern pintail (*Anas acuta*), Northern shoveler (*Anas clypeata*), canvasback (*Aythya valisineria*), greater scaup (*Aythya marila*), lesser scaup (*Aythya affinis*), common merganser (*Mergus merganser*), red-breasted merganser (*Mergus serrator*), hooded merganser (*Lophodytes cucullatus*), American coot (*Fulica americana*), bufflehead (*Bucephala albeola*), Atlantic brant (*Branta bernicla*), common goldeneye (*Bucephala clangula*), long-tailed duck (*Clangula hyemalis*), tundra swan (*Cygnus columbianus*), Muscovy duck (*Cairina moschata*), and pied-billed grebe (*Podilymbus podiceps*).

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

This EA analyzes the potential effects of conducting alternative approaches to addressing waterfowl damage, as coordinated with the USFWS, the Virginia Department of Game and Inland Fisheries (VDGIF), and the Virginia Department of Agriculture and Consumer Services (VDACS) along with other

[1]The USDA-APHIS-WS program is authorized to protect agriculture and other resources from damage caused by wildlife through the Act of March 2, 1931 (46 Stat. 1468; 7 U.S.C. 426-426b) as amended, and the Act of December 22, 1987 (101 Stat. 1329-331, 7 U.S.C. 426c).

governmental agencies, and private entities, as appropriate, in the Commonwealth under Memorandum of Understanding (MOU), Cooperative Service Agreement, or other comparable document. The EA also addresses the potential effects of managing waterfowl damage on areas where additional agreements may be signed in the future. Because the proposed action is to conduct a coordinated waterfowl damage management program in accordance with plans, goals, and objectives developed to reduce damage, and because the program's goals and directives are to provide services when requested, within the constraints of available funding and workforce, it is conceivable that additional damage management efforts could occur. Thus, this EA anticipates those additional efforts and the analyses are intended to apply to actions that may occur in any locale and at any time within Virginia as part of a coordinated program.

WS previously developed an EA that addressed WS' activities to manage damage associated with Canada geese and urban ducks in the Commonwealth (USDA 1999). Based on the analyses in that EA, a Decision and Finding of No Significant Impact was signed selecting the proposed action alternative. The proposed action alternative implemented a waterfowl damage management program using a variety of methods in an integrated approach (USDA 1999). Changes in the need for action and the affected environment have prompted WS and cooperating agencies to initiate this new analysis to address waterfowl damage management activities in the Commonwealth. This EA will address more recently identified changes and will assess the potential environmental impacts of program alternatives based on a new need for action, primarily a need to address damage and threats of damage associated with several species of waterfowl. In addition, this EA will: (1) assist in determining if the proposed management of damage associated with waterfowl could have a significant impact on the environment for both humans and other organisms, (2) analyze several alternatives to address the need for action and the identified issues, (3) coordinate efforts between WS, the USFWS, and other entities, (4) inform the public, and (5) document the analyses of the environmental consequences of the alternatives to comply with the NEPA. Since activities conducted under the previous EA will be re-evaluated under this EA to address the new need for action and the associated affected environment, the previous EA that addresses Canada geese and urban ducks will be superseded by this analysis and the outcome of the Decision issued on this EA[2].

1.2 NEED FOR ACTION

Some species of wildlife have adapted to and thrive in human altered habitats. Those species, in particular, are often responsible for the majority of conflicts between humans and wildlife that lead to requests for assistance to reduce damage to resources and to reduce threats to human safety. WS' programmatic FEIS summarizes the relationship of wildlife values and wildlife damage in this way (USDA 1997):

> "*Wildlife has either positive or negative values, depending on varying human perspectives and circumstances...Wildlife is generally regarded as providing economic, recreational and aesthetic benefits...and the mere knowledge that wildlife exists is a positive benefit to many people. However... the activities of some wildlife may result in economic losses to agriculture and damage to property...Sensitivity to varying perspectives and values are required to manage the balance between human and wildlife needs. In addressing conflicts, wildlife managers must consider not only the needs of those directly affected by wildlife damage but a range of environmental, sociocultural and economic considerations as well*".

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

[2] After the development of the EA by WS and consulting agencies and after public involvement in identifying new issues and alternatives, WS issues a Decision based on the analysis in the EA which is noticed to the public. The Decision is made by WS and cooperating agencies to either publish a Notice of Intent to prepare an Environmental Impact Statement or a notice of a Finding of No Significant Impact is published in accordance with the NEPA, the Council of Environmental Quality regulations, and APHIS' NEPA implementation regulations.

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

The alleviation of damage or other problems caused by or related to the behavior of wildlife is termed wildlife damage management and is recognized as an integral component of wildlife management (The Wildlife Society 1992). The imminent threat of damage or loss of resources is often sufficient for individual actions to be initiated and the need for damage management is derived from the specific threats to resources. Those species have no intent to do harm. They utilize habitats (*e.g.*, reproduce, walk, forage) where they can find a niche. If their activities result in lost economic value of resources or threaten human safety, people characterize this as damage. When damage exceeds or threatens to exceed an economic threshold and/or pose a threat to human safety, people seek assistance with resolving damage or reducing threats to human safety. The threshold triggering a request for assistance is often unique to the individual person requesting assistance and can be based on many factors (*e.g.*, economic, social, aesthetics). Therefore, how damage is defined is often unique to the individual person and damage occurring to one individual may not be considered damage by another individual. However, the use of the term "*damage*" is consistently used to describe situations where the individual person has determined the losses associated with wildlife is actual damage requiring assistance (*i.e.*, has reached an individual threshold). The term "*damage*" is most often defined as economic losses to resources or threats to human safety but could also include a loss in aesthetic value and other situations where the actions of wildlife are no longer tolerable to an individual person.

Waterfowl add an aesthetic component to wetlands, sometimes provide opportunities for recreational hunting, and like all wildlife, provide people with valued close contact with nature. Many people, even those experiencing damage, consider waterfowl to be charismatic and valuable component of their environment; however, tolerance differs among individuals (Smith et al. 1999). Because of their prolific nature, site tenacity, longevity, size, and tolerance of human activity, waterfowl are often associated with situations where damage or threats can occur. For example, geese are extremely adaptable and may use the resources provided by humans in urban landscapes for nesting, raising young, molting, feeding, and loafing. Increasing populations of resident geese are resulting in increasing numbers of conflicts with human activities (Conover and Chasko 1985, USFWS 2005, Dolbeer and Seubert 2006), and increasing concerns related to human health and safety (Ankney 1996, Seubert and Dolbeer 2004, USFWS 2005, Dolbeer and Seubert 2006).

The need for action to manage damage associated with waterfowl in the Commonwealth arises from requests for assistance[3] received by WS to reduce and prevent damage and threats associated with waterfowl from occurring to four major categories (USDA 1999). Those four major categories include agricultural resources, natural resources, property, and threats to human safety. The need for an increase in damage management activities in the Commonwealth is based on an increase in the requests received

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

to manage damage and threats or based on a reasonable anticipation of an increase in requests for damage management activities for several species of waterfowl that threaten those resources. The number of requests WS has received for assistance to manage threats associated with waterfowl and the number of species of waterfowl associated with those requests for assistance has increased. As part of the increase in requests for assistance, WS is also receiving requests to assist with damage and threats associated with several species of waterfowl. WS also anticipates an increase in requests to use non-lethal harassment and dispersal methods to alleviate damage associated with those species addressed in this EA as part of the increasing requests for assistance.

WS continues to receive requests for assistance from governmental and private entities to manage damage and threats associated with waterfowl in the Commonwealth (USDA 1999). Damage caused by waterfowl in the Commonwealth occurs primarily to agricultural resources and property. Agricultural damage occurs when waterfowl consume plants and crops, trample standing crops as they forage, and defecate on plants which can lead to economic losses to agricultural producers. Accumulations of fecal droppings from waterfowl and overgrazing of vegetation are the primary causes of property damage, which may require constant repair and clean-up and can be aesthetically displeasing. Damage and threats can occur to natural resources when overgrazing by waterfowl threatens natural areas and plant communities. Threats to human safety occur from the potential for aircraft to strike waterfowl at airports and from risks associated with disease transmission in areas where the public is likely to encounter accumulations of waterfowl droppings. Additionally, aggressive waterfowl may pose a threat to human safety by attacking people or chasing them and causing subsequent injury (*e.g.*, falling while attempting to escape aggressive geese).

Table 1.1 lists the number of waterfowl damage management requests by the four major resource types that WS has received in the Commonwealth from the federal fiscal year[4] (FY) 2004 through FY 2009 based on technical assistance requests. Technical assistance is provided by WS to those persons requesting assistance with resolving damage or the threat of damage by providing information and recommendations on waterfowl damage management activities that can be conducted by the requestor without WS' direct involvement in managing or preventing the damage. WS' technical assistance activities will be discussed further in Chapter 3 of this EA.

The technical assistance projects conducted by WS are representative of the damage and threats that are caused by waterfowl in the Commonwealth. Since FY 2004, WS has conducted 1,447 individual technical assistance projects in the Commonwealth that addressed damage and threats associated with waterfowl. Many of those projects involved multiple resources and multiple species. Nearly 64% of the requests for assistance received involved waterfowl damage or the threat of damage to property. Property damage can occur from accumulations of fecal droppings as well as from waterfowl trampling and overgrazing turf and other vegetation. Waterfowl can also cause damage to property when struck by aircraft at airports. Those persons requesting assistance with damage to property caused by waterfowl have reported to WS or WS has verified $774,143 in damages in the Commonwealth since FY 2004 (see Table 1.2).

WS has conducted 195 technical assistance projects since FY 2004 that involved requests for assistance to manage damage or threats to agricultural resources in the Commonwealth. Damage to agricultural resources occurs from waterfowl directly consuming crops or damages that occur from consuming the crop (*e.g.*, trampling of standing plants, disease introduction to damaged areas of the plant). Damages to agricultural resources occur primarily from geese foraging on crops, primarily soybeans in the Commonwealth. When waterfowl densities are high, the consumption of agricultural crops can lead to economic losses to agricultural resources. When economic losses occur, agricultural producers often seek

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

assistance with resolving damage or the threat of damage. Since FY 2004, waterfowl damage to agricultural resources that has been report to or verified by WS has totaled $625,032 in damages.

Table 1.1 – Requests for waterfowl damage assistance received by WS in Virginia

Fiscal Year	Agriculture	Human Safety	Property	Natural Resources	Total
2004	38	33	134	4	**209**
2005	31	25	117	6	**179**
2006	28	61	178	3	**270**
2007	24	80	168	14	**286**
2008	31	48	160	4	**243**
2009	43	48	166	3	**260**
Total	**195**	**295**	**923**	**34**	**1,447**

Although monetary damages to natural resources and human safety have been reported and verified by WS, requests for assistance often address threats that waterfowl can pose to human safety and natural resources for which monetary losses are difficult to determine. Since FY 2004, after receiving requests for assistance, WS has verified or those requesting assistance have reported over $97,000 in damages caused by waterfowl to natural resources and costs involved with human safety. For human safety, requests for WS' assistance are often received to reduce the threat of disease transmission and the threat of aircraft striking waterfowl at airports. Most requests for assistance received by WS involving threats to human safety arise from the risks associated with disease transmission from fecal droppings left by waterfowl in areas where the public may encounter waterfowl feces or where fecal matter may contaminate public water sources or swimming areas. Aircraft striking waterfowl can cause catastrophic failure of the aircraft, which has the potential to threaten passenger safety if the aircraft is unable to make a safe landing. The difficulties of placing a monetary value on reducing threats to human safety and natural resources are similar. WS has and likely will continue to receive requests to reduce threats to natural resources such as overgrazing on turf and shrubs.

Table 1.2 – Waterfowl damage by resource reported or verified by WS in the Commonwealth

	Resource Category				
Fiscal Year	**Agriculture**	**Property**	**Natural Resources**	**Human Safety**	**TOTAL**
2004	$375,000	$129,500	$1,000	$0	$505,500
2005	$77,283	$141,125	$20,000	$0	$238,408
2006	$8,400	$16,550	$70,000	$5,000	$99,950
2007	$56,800	$61,300	$0	$0	$118,100
2008	$36,200	$262,150	$1,000	$30	$299,380
2009	$71,349	$163,518	$0	$600	$235,467
TOTAL	**$625,032**	**$774,143**	**$92,000**	**$5,630**	**$1,496,805**

As stated previously, the need for action arises from requests received from Commonwealth, federal, and private entities to provide assistance with resolving damage or threats of damage to four main categories of resources in Virginia: agricultural resources, natural resources, property, and human safety. Since FY 2004, WS has responded to 1,447 requests for assistance associated with waterfowl that involved providing technical assistance. In addition, WS has verified or those persons requesting assistance have reported nearly $1.5 million in damage caused by waterfowl since FY 2004 in the Commonwealth, which is likely only a portion of the actual damages occurring since not all damage is reported to or verified by WS. More specific information regarding waterfowl damage to those main categories is discussed in the following subsections of the EA:

Need for Waterfowl Damage Management to Protect Human Safety

Birds can play an important role in the transmission of zoonotic diseases (*i.e.*, animal diseases transmissible to humans) 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. The presence of disease causing organisms in waterfowl feces is a result of the pathogens being present in the environment in which waterfowl live. Waterfowl likely acquire disease-causing organisms through ingestion of pathogens that originated in the environment. Disease-causing organisms do not originate with waterfowl (*i.e.*, waterfowl do not produce disease-causing organisms) but those waterfowl can act as reservoirs for disease causing organisms that are of concern to human safety. Of concern, is the ability of waterfowl to obtain disease causing organisms and transporting those organisms to other areas, especially to areas with a high amount of human activity. With the ability to fly and move from one location to another, waterfowl can obtain a disease causing organism at one location and transfer the disease causing organism from that location to another location. Human exposure to fecal droppings through contact or through the disturbance of accumulations of fecal droppings where disease organisms are known to occur increases the likelihood of disease transmission. Waterfowl can be closely associated with human habitation where interaction with waterfowl or fecal droppings can occur. Waterfowl often exhibit gregarious behavior 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 those species of birds with human activity. Accumulations of bird droppings in public areas are aesthetically displeasing and are often in areas where humans may come into contact with fecal droppings.

Waterfowl may 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 risk of infection is believed to be low (Centers for Disease Control and Prevention (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 waterfowl 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. Flemming et al. (2001) reviewed the impacts of Canada geese on water quality 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 authorized the take of geese through the issuance of depredation permits to reduce the threat of disease transmission (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.

Avian botulism is produced by the bacteria *Clostridium botulinum* type C which occurs naturally in wild bird populations across North America. Ducks are most often affected by this disease, but it can also affect Canada geese. Avian botulism is the most common disease of waterfowl. Increased numbers of Canada geese using recreational areas increases the exposure risk to the pubic (McLean 2003).

Salmonella (*Salmonella* spp.) may be contracted by humans by handling materials soiled with bird feces (Stroud and Friend 1987). Salmonella 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 of *E. coli* 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 adversely affect 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. However, he did report finding *Cryptosporidium* spp. in 49 (10%) of the 500 geese, and *Giardia* sp. in 75 (15%) of the geese. Additionally, the United States Geological Survey (USGS) conducted field studies in New Jersey, Virginia, and Massachusetts to determine the presence of organisms that could cause disease in humans exposed to feces of Canada geese at sites with a history of high public use and daily use by geese (USGS 2000). *Salmonella* spp., *Listeria* spp., *Chlamydia* spp., and *Giardia* spp. were isolated from goose feces in New Jersey (USGS 2000).

While transmission of diseases or parasites from 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 worse 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 and other waterfowl 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 those species of birds with human activity. Accumulations of bird droppings in public areas are aesthetically displeasing and are often in areas where humans may come into contact with fecal droppings. WS recognizes and defers to the authority and expertise of local and state health officials in determining what does or does not constitute a threat to public health.

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 waterfowl attacking humans occurs rarely, aggressive behavior by waterfowl 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 at areas used by humans 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 waterfowl on docks, walkways, and other areas of foot traffic.

Waterfowl can 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 health and 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 1990-2008, approximately 59% of reported bird strikes to United States civil aviation occurred when the aircraft was at an altitude of 100 feet above ground level or less (Dolbeer et al. 2009). Additionally, 72% occurred less than 500 feet above ground level and about 92% occurred under 3,000 feet above ground level (Dolbeer et al 2009). Birds were involved in more than 97% of the reported wildlife strikes to civil aircraft in the United States from 1990-2008 (Dolbeer et al. 2009).

From 1990-2008, waterfowl (geese and ducks) were involved in 8% of all bird-aircraft strikes to civil aviation reported to the Federal Aviation Administration (FAA) for which bird species or group were reported (Dolbeer et al. 2009). Waterfowl were involved in the greatest number of damaging strikes (31%) in which the bird species was identified when compared to all other bird groups (Dolbeer et al. 2009). Nationally, the resident Canada goose population probably represents the single most serious bird threat to aircraft safety (Alge 1999, Suebert and Dolbeer 2004, Dolbeer and Seubert 2006). Resident Canada geese are of particular concern to aviation because of their large size (typically 8-15 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 1990-2008, there were 1,181 reported strikes involving Canada geese in the United States, resulting in over $50 million in damage and associated costs to civil aircraft (Dolbeer et al. 2009). The threat that Canada geese pose to aircraft safety was dramatically demonstrated in January 2009 when US Airways Flight 1549 made an emergency landing in the Hudson River after ingesting multiple Canada geese into both engines shortly after takeoff from New York's LaGuardia Airport (Dolbeer et al. 2009, Wright 2010). Though the aircraft was destroyed after sinking in the river, all 150 passengers and 5 crew members survived (Wright 2010). In addition to civil aviation, the United States Air Force (USAF) reports that Canada geese have caused nearly $93 million in damage and have been involved in 139 strikes since the beginning of their recording period through 2007, averaging nearly $670,000 in damages per strike (USAF 2009). In 1995, a Boeing 707 E38 AWACS jet taking off from Elmendorf Air Force Base in Alaska ingested at least 13 geese into the number 1 and 2 engines and crashed, killing all 24 crew members. From 1990 through September of 2009, there were 1,256 wildlife strikes were reported to the FAA in the Commonwealth, with 103 strikes involving waterfowl (FAA 2010). The number of bird strikes actually occurring is likely to be much greater, since it is estimated that only 20-25% 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). Additionally, many of the strikes that have been reported in Virginia did not identify the species involved (FAA 2010).

Need for Waterfowl Damage Management to Prevent Damage and Threats to Agriculture

The most common waterfowl damage to agriculture is crop consumption (*i.e.*, 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. Canada geese graze a variety of crops, including alfalfa, barley, beans, corn, soybeans, wheat, rye, oats, spinach, and peanuts (Atlantic Flyway Council 1999). In Virginia, WS has documented waterfowl damage to soybeans, corn, peanuts, wheat, rye, oats, alfalfa, and rangeland. Producers in the Commonwealth reported to WS that waterfowl were responsible for agricultural losses totaling $625,032 from between FY 2004 and FY 2009 (see Table 1.2). A single intense grazing event by Canada geese in fall, winter, or spring can reduce the yield of winter wheat by 16-30% (Fledger et al. 1987), and reduce growth of rye

plants by more than 40% (Conover 1988). However, some research has reported that grazing by geese during the winter may increase rye or wheat seed yields (Clark and Jarvis 1978, Allen et al. 1985).

Since 1985, agricultural practices have changed resulting in intensive wheat growing practices with much higher yields of approximately 100 bushels per acre, but these crops are unable to sustain even light grazing pressure without losing yield. Associated costs with agricultural damage involving waterfowl include costs to replant grazed crops (*e.g.*, soybeans, corn, peanuts), implement non-lethal wildlife management practices, purchase replacement hay, and decreased yields.

Waterfowl, especially resident Canada geese, are also a concern to livestock producers. Waterfowl droppings in and around livestock ponds can affect water quality and are a source of a number of different types of bacteria, creating concerns about potential disease interactions between waterfowl and livestock. The transmission of diseases through drinking water is one of the primary concerns for a safe water supply for livestock. Bacteria levels for livestock depend on the age of the animal since adults are more tolerant of bacteria than young animals (Mancl 1989). The bacteria guidelines for livestock water supplies are <1000 fecal coliforms/100 ml for adult animals and < 1 fecal coliform/100 ml for young animals (Mancl 1989). Although no direct links have been made, salmonella outbreaks have occurred in cattle on farms in northern Virginia when large numbers of geese were present. Salmonella causes shedding of the intestinal lining and severe diarrhea in cattle. If undetected and untreated, salmonella can kill cattle and calves.

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

While Canada geese have been implicated in causing Bovine Coccidiosis in calves, the coccidia which infect cattle is a different species of coccidia than the coccidia which infects Canada geese (Doster 1998). Causes of coccidia in cattle are from other infected cattle (Doster 1998).

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

Waterfowl can also negatively impact Virginia's natural resources. Large concentrations of waterfowl have affected water quality around beaches and in wetlands by acting as nonpoint source pollution. There are four forms of nonpoint source pollution: sedimentation, nutrients, toxic substances, and pathogens. Large concentrations of waterfowl can remove shoreline vegetation resulting in erosion of the shoreline and soil sediments being carried by rainwater into lakes, ponds, and reservoirs (USFWS 2005). WS has assisted cooperators in Virginia with managing Canada 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. Mute swans can have detrimental impacts on wetland habitat and native waterfowl species (Atlantic Flyway Council 2003). Mute swans can consume on average 39% of their body weight daily and therefore can have devastating effects on the viability of aquatic plant beds. Competition for habitat makes mute swans a threat to native waterfowl. During the nesting season, mute swans will vigorously defend nest and brood sites from intrusion by other bird species. Mute swans have also been documented destroying nests and displacing tern colonies (G. Costanzo, VDGIF, pers. comm. 2010). Additionally, feral flocks of mute swans are a concern as

reservoirs for Duck Virus Enteritis (DVE) and other avian diseases that affect wild bird populations and create significant cost for agencies responding to the waterfowl die-offs (G. Costanzo, VDGIF, pers. comm. 2010).

Waterfowl can threaten the health of the environment by damaging manmade structures holding waste water which is regulated by the Virginia Department of Environmental Quality (DEQ). Severe grazing of 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. Sewage treatment plants in Virginia are required to test water quality of effluents before release from finishing ponds into the environment. Sewage treatment plants find coliform bacteria counts increase dramatically when large numbers of Canada geese are present and decline dramatically when the geese are removed (A. Pratt, Upper Occoquan Sewage Authority, unpublished data). 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 P 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).

Need for Waterfowl Damage Management to Prevent Damage and Threats to Property

Waterfowl 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 pollutes and contaminates landscaping and walkways, often at golf courses and water front property, or grazing damage to landscaping and turf. Businesses may be concerned about the negative aesthetic appearance of their property caused by excessive droppings and excessive grazing, and are sensitive to comments by clients and guests. Costs associated with property damage include labor and disinfectants to clean and sanitize fecal droppings, implementation of non-lethal wildlife management methods, loss of property use, loss of aesthetic value of flowers, gardens, and lawns consumed by waterfowl, loss of customers or visitors irritated by walking in fecal droppings, repair of golf greens, and replacing grazed turf.

As an example, the annual clean-up costs associated with removing goose fecal droppings from lawns, walkways, and beaches in Maryland and the efforts to prevent further accumulations of droppings likely exceeds $150,000 annually (USFWS 2005). 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).

Between 1990 and 2008, a total of 1,181 reports of aircraft striking Canada geese in the United States have been reported to the FAA with over 51% of those strikes resulting in damage to the aircraft (Dolbeer et al. 2009). Nearly 27% of the reported goose strikes resulted in a negative effect on the flight of the

aircraft (*e.g.*, aircraft had to make an emergency landing). Of the 1,181 reported aircraft strikes involving geese, 509 of those reports involved aircraft striking multiple geese (Dolbeer et al. 2009). Reported goose strikes in the United States from 1990 through 2008 have resulted in 59,087 hours of aircraft down time and resulting in nearly $51 million in repair costs (Dolbeer et al. 2009). 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). The USAF has reported that aircraft striking Canada geese have resulted in nearly $93 million in damages to military aircraft (USAF 2009).

Dolbeer et al. (2009) reported that 3,175 aircraft strikes have been reported in the United States between 1990 and 2008 that involved waterfowl species. Nearly 45% of those waterfowl strikes reported resulted in damage occurring to the aircraft with nearly 22% having a negative effect on the status of the flight. Aircraft strikes involving waterfowl species has resulted in 110,135 hours of aircraft down time with reported damages of more than $101 million (Dolbeer et al. 2009).

1.3 SCOPE OF THIS EA

Action Analyzed

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

The methods available for use under the alternatives evaluated are provided in Appendix B. The alternatives and Appendix B also discuss how methods would be employed to manage damage and threats associated with waterfowl in the Commonwealth. Therefore, the actions evaluated in this EA are the use of those methods available under the alternatives and the employment of those methods by WS to manage or prevent damage and threats associated with waterfowl from occurring when permitted by the USFWS. In addition, this EA evaluates the permitting of take by the USFWS to other entities to address waterfowl damage in the Commonwealth.

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

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

Period for which this EA is Valid

If the analyses in this EA indicates an Environmental Impact Statement (EIS) is not required, this EA would remain valid until WS determines that new needs for action, changed conditions, or new alternatives having different environmental impacts must be analyzed. At that time, this analysis and document would be reviewed and supplemented pursuant to the NEPA. Review of the EA would be conducted each year to ensure that the EA is sufficient. If the alternative analyzing no involvement in waterfowl damage activities by WS is selected, no annual analyses would occur based on the lack of involvement by WS. Annual monitoring of activities ensures the EA remains appropriate to the scope of waterfowl damage management activities conducted by WS in Virginia.

Site Specificity

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

This EA analyzes potential effects of conducting alternative approaches to managing damage caused by waterfowl on private or public property under MOUs, cooperative service agreements, or other comparable documents, and in cooperation with the appropriate land management agencies. It also addresses the effects of management actions in areas where additional agreements for damage management may be signed in the future. Thus, this EA anticipates this potential for additional requests and analyzes the impacts of such efforts as part of the program.

Planning for the management of waterfowl damage must be viewed as being conceptually similar to other agency actions whose missions are to stop or prevent adverse consequences from anticipated and unanticipated future events for which the actual sites and locations are unknown but could be anywhere in a defined geographic area. Examples of such agencies and programs include fire departments, police departments, and emergency clean-up organizations. Although some of the sites where waterfowl damage will occur can be predicted, all specific locations or times where such damage will occur in any given year cannot be predicted. The EA emphasizes important issues as they relate to specific areas whenever possible. However, the issues that pertain to the various types of waterfowl damage and resulting management are generally the same wherever they occur and are treated as such.

Chapter 2 of this EA identifies and discusses issues relating to waterfowl damage management in Virginia. The standard WS Decision Model (Slate et al. 1992, USDA 1997) would be the site-specific procedure for individual actions conducted by WS in the Commonwealth (see Chapter 3 for a description of the Decision Model and its application). Decisions made using the model would be in accordance with WS' directives and SOPs described in this EA.

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

Summary of Public Involvement

Issues related to waterfowl damage management and the alternatives to address those issues were initially developed by an interagency team comprised of personnel from WS and the USFWS with review from the VDGIF. Issues were defined and preliminary alternatives were identified through the interagency team. As part of this process, and as required by the Council on Environmental Quality (CEQ) and APHIS' NEPA implementing regulations, this document will be noticed to the public through legal notices published in local media, through direct mailings to parties that have requested to be notified, or have been identified to have an interest in the reduction of threats and damage caused by waterfowl in Virginia, and by posting the EA on the APHIS website at http://www.aphis.usda.gov/wildlife_damage/nepa.shtml.

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

Native American Lands and Tribes

Currently, WS does not have a MOU or signed agreement with any Native American tribe in the Commonwealth. If WS enters into an agreement with a tribe, this EA would be reviewed and supplemented, if appropriate, to ensure compliance with the NEPA.

Federal, Commonwealth, County, City, and Private Lands

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

1.4 RELATIONSHIP OF THIS EA TO OTHER ENVIRONMENTAL DOCUMENTS

WS' Programmatic FEIS

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. Information from WS' programmatic FEIS has been incorporated by reference into this EA.

USFWS Resident Canada Goose Management FEIS

The USFWS has issued a FEIS addressing the need for and potential environmental impacts associated with goose damage management activities entitled "*Resident Canada Goose Management*" (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 USFWS (2005) has been incorporated by reference into this EA.

USFWS Light Goose Management FEIS

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

WS' Waterfowl Damage Management Environmental Assessment

As was stated previously, WS previously developed an EA that addressed WS' activities to manage damage associated with Canada geese and urban ducks in the Commonwealth (USDA 1999). Based on the analyses in that EA, a Decision and Finding of No Significant Impact was signed selecting the proposed action alternative. The proposed action alternative implemented a waterfowl damage management program using a variety of methods in an integrated approach (USDA 1999). Changes in the need for action and the affected environment have prompted WS and cooperating agencies to initiate this new analysis to address waterfowl damage management activities in the Commonwealth. This EA will address more recently identified changes and will assess the potential environmental impacts of program alternatives based on a new need for action, primarily a need to address damage and threats of damage associated with several additional species of waterfowl. Since activities conducted under the previous EA will be re-evaluated under this EA to address the new need for action and the associated affected environment, the previous EA that addresses Canada geese and urban ducks will be superseded by this analysis and the outcome of the Decision issued based on the analyses in this EA. However, information in the need for action in the previous EA relative to Canada geese and urban ducks continues to be appropriate to the need for action associated with this EA (USDA 1999).

Atlantic Flyway Mute Swan Management Plan 2002-2013

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

1.5 DECISIONS TO BE MADE

Based on agency relationships, MOUs, and legislative authorities, WS is the lead agency for this EA, and therefore, responsible for the scope and content. Management of migratory birds is the responsibility of the USFWS. As the authority for the management of bird populations in the Commonwealth, the USFWS was involved in the development of the EA and provided input throughout the EA preparation process to ensure an interdisciplinary approach according to the NEPA and agency mandates, policies, and regulations. The VDGIF is responsible for managing wildlife in the Commonwealth of Virginia, including waterfowl. WS' activities to reduce and/or prevent waterfowl damage in the Commonwealth would be coordinated with the USFWS and the VDGIF which ensure WS' actions are incorporated into population objectives established by those agencies for bird populations in the Commonwealth.

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

1.6 AUTHORITIES OF FEDERAL AND COMMONWEALTH AGENCIES

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

WS' Legislative Authority

The primary statutory authority for the WS program is the Act of March 2, 1931 (46 Stat. 1468; 7 U.S.C. 426-426b) as amended, and the Act of December 22, 1987 (101 Stat. 1329-331, 7 U.S.C. 426c). The WS program is the lead federal authority in managing damage to agricultural resources, natural resources, property, and threats to human safety associated with wildlife. WS' directives[5] define program objectives and guide WS' activities in managing wildlife damage.

United States Fish and Wildlife Service

The USFWS is the primary federal agency responsible for conserving, protecting, and enhancing the nation's fish and wildlife resources and their habitats. Responsibilities are shared with other federal, Commonwealth, tribal, and local entities; however, the USFWS has specific responsibilities for the protection of T&E species under the Endangered Species Act (ESA), migratory birds, inter-jurisdictional fish, and certain marine mammals, as well as for lands and waters that the USFWS administers for the management and protection of those resources. The USFWS also manages lands under the National Wildlife Refuge System.

The USFWS is responsible for managing and regulating take of bird species that are listed as migratory under the MBTA and those that are listed as threatened or endangered under the ESA. The take of

[5]WS' Directive could be found at the following web address http://www.aphis.usda.gov/wildlife_damage/ws_directives.shtml during the development of this EA.

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

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

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

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

Virginia Department of Game and Inland Fisheries Legislative Mandate

The VDGIF, under the direction of the Governor-appointed Board of Directors, is specifically charged by the General Assembly with the management of the Commonwealth's wildlife resources. Although many legal mandates of the Board and the Department are expressed throughout the Code of Virginia, the primary statutory authorities include wildlife management responsibilities (VAC§§29.1-103), public education charges (VAC§§29.1-109), law enforcement authorities (VAC§§29.1-109), and regulatory powers (VAC§§29.1-501). The mission of the VDGIF is:

- To manage Virginia's wildlife and inland fish to maintain optimum populations of all species to serve the needs of the Commonwealth;
- To provide opportunity for all to enjoy wildlife, inland fish, boating and related outdoor recreation and to work diligently to safeguard the rights of the people to hunt, fish and harvest game as provided for in the Constitution of Virginia;
- To promote safety for persons and property in connection with boating, hunting and fishing;
- To provide educational outreach programs and materials that foster an awareness of and appreciation for Virginia's fish and wildlife resources, their habitats, and hunting, fishing, and boating opportunities.

For the purposes of regulating the harvest of waterfowl in the Commonwealth, the VDGIF establishes annual take limits and hunting seasons under frameworks created by the USFWS pursuant to the MBTA.

Virginia Department of Agriculture and Consumer Services

The VDACS may provide assistance to persons in the Commonwealth in order to reduce damage to agricultural resources and property, and to protect public health and safety from damage involving

nuisance birds (VAC § 3.2-901). VDACS currently has a MOU with WS which establishes a cooperative relationship between WS and VDACS, outlines responsibilities, and sets forth annual objectives and goals of each agency for resolving wildlife conflicts in Virginia.

United States Environmental Protection Agency (EPA)

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

1.7 COMPLIANCE WITH LAWS AND REGULATIONS

Several laws and regulations pertaining to wildlife damage management activities, including activities conducted in the Commonwealth are discussed below. Additional laws and regulations pertaining to wildlife damage management activities are addressed in WS' programmatic FEIS (USDA 1997). Those laws and regulations relevant to waterfowl damage management activities in the Commonwealth are addressed below:

National Environmental Policy Act

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

Pursuant to the NEPA and CEQ regulations, this EA documents the analyses resulting from proposed federal actions, informs decision-makers and the public of reasonable alternatives capable of avoiding or minimizing adverse impacts, and serves as a decision-aiding mechanism to ensure that the policies and goals of the NEPA are infused into federal agency actions. This EA was prepared by integrating as many of the natural and social sciences as warranted, based on the potential effects of the proposed actions. The direct, indirect, and cumulative impacts of the proposed action are analyzed.

The NEPA requires federal agencies to incorporate environmental planning into federal agency actions and decision-making processes. The two primary objectives of the NEPA are: 1) agencies must have available and fully consider detailed information regarding environmental effects of federal actions and 2) agencies must make information regarding environmental effects available to interested persons and agencies before decisions are made and before actions are taken.

The NEPA provides a systemic process to determine the class of action necessary when potential environmental effects are identified. Generally, there are three classes of action: 1) Categorical Exclusions, 2) Environmental Assessments, and 3) Environmental Impact Statements.

This EA will assist WS and consulting agencies in determining whether potential environmental impacts caused by a proposed action might be significant, requiring the preparation of an EIS. The development of this EA documents the incorporation of environmental planning into the actions and decision-making process to ensure compliance with the NEPA requirement for the proposed action in the Commonwealth.

Endangered Species Act

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

WS has conducted a formal consultation with the USFWS on programmatic activities and received a Biological Opinion (BO) describing potential effects on T&E species and prescribes reasonable and prudent measures for avoiding jeopardy (USDA 1997). WS has re-initiated formal consultation with the USFWS on programmatic activities to address T&E species proposed and listed since the BO was completed in 1992 and to address new methods available for managing damage and threats to human safety from wildlife. As part of the development of this EA, WS initiated informal consultation with the USFWS. Based on the review of T&E species in the Commonwealth, the methods available for use to manage damage caused by waterfowl, and the scope of damage management activities, WS has determined that when activities are conducted pursuant to this EA, those activities are not likely to adversely affected any T&E species in the Commonwealth. The USFWS, Ecological Services, has concurred with this determination (C. Schulz, USFWS, letter to J. Cromwell, WS, August 10, 2010). Additionally, WS has determined that waterfowl damage management activities conducted pursuant to this EA are not likely to adversely affect critical habitat in Virginia.

Migratory Bird Treaty Act of 1918 (U.S.C. 703711: 40 Stat. 755), as amended

The MBTA provides the USFWS regulatory authority to protect families of migratory birds. A complete list of bird species afforded protection under the MBTA can be found at 50 CFR 10.13. The law prohibits any "*take*" of migratory bird species by any entities, except as permitted by the USFWS. Under permitting guidelines in the Act, the USFWS may issue depredation permits to requesters experiencing damage caused by bird species protected under the Act (see 50 CFR 21). All actions conducted in this EA will be in compliance with the regulations of the MBTA, as amended.

The law was further clarified to include only those birds considered migratory and native to the United States by the Migratory Bird Treaty Reform Act of 2004. Under the Reform Act, the USFWS published a list of bird species not protected under the MBTA (70 FR 12710-12716). Free-ranging or feral domestic waterfowl, including mute swans, are not protected from take under the MBTA. A permit from the USFWS to take free-ranging or feral domestic ducks or mute swans is not required.

Due to an increasing resident Canada goose population and an increase in damage complaints received, the USFWS developed an EIS that analyzed issues and alternatives associated with managing resident goose populations (USFWS 2005). Based on the analyses in the FEIS, several depredation orders were established to address goose damage which allow for the take of geese (see 50 CFR 21.49, 50 CFR 21.50, 50 CFR 21.51, 50 CFR 21.52, and 50 CFR 21.61). In addition, the USFWS has established a depredation order for Muscovy ducks (see 50 CFR 21.14, 50 CFR 21.25, and 50 CFR 21.54). A conservation order was also established for light geese (snow geese) to allow for additional harvesting opportunities to manage populations (see 50 CFR 21.60).

Depredation Orders for Canada Geese

As discussed previously, the USFWS developed an EIS to evaluate alternatives to address increasing resident goose population across the United States and to reduce associated damage (USFWS 2005). In addition, several depredation orders have been 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 Virginia, 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 Commonwealth permit may still be required to lethally take geese.

Depredation Order for Muscovy Ducks

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

Conservation Order for Light Geese

The USFWS recently finalized rules allowing the use of expanded hunting methods and implementation of a conservation order to increase light goose (*i.e.*, snow geese and Ross's geese) harvest. The final rule authorizes the use of new hunting methods, such as electronic calls and unplugged shotguns, to harvest light geese during normal hunting season frameworks. These regulations are allowed during a light-goose-only hunting season when all other waterfowl and crane hunting seasons, excluding falconry, are closed. Further, the rule authorizes States to implement a conservation order to allow the harvest of light geese outside of traditional hunting seasons. In addition, the conservation order allows shooting hours to continue until one-half hour after sunset and removes the daily bag limit for light geese.

Federal Insecticide, Fungicide, and Rodenticide Act

The FIFRA requires the registration, classification, and regulation of all pesticides used in the United States. The EPA is responsible for implementing and enforcing FIFRA. All chemical methods integrated into the WS program in the Commonwealth are registered with and regulated by the EPA and the VDACS, and used by WS in compliance with labeling procedures and requirements. No toxicants are currently used or registered for use in managing waterfowl or reducing waterfowl damage. There are

several repellents that are registered for use in reducing waterfowl damage to vegetation in the Commonwealth (see Appendix B). Methyl anthranilate and anthraquinone are the two most common active ingredients for repellents available for dispersing waterfowl from areas where damage or threats are occurring. Currently, the only reproductive inhibitor that is registered with the EPA are products containing the active ingredient nicarbazin which is registered for use to manage populations of Canada geese, domestic mallards, Muscovy ducks, other feral waterfowl, and rock pigeons (*Columba livia*) by reducing or eliminating the hatchability of eggs laid.

Investigational New Animal Drug (INAD)

The United States Food and Drug Administration (FDA) can grant permission to use investigational new animal drugs (see 21 CFR 511). The sedative drug alpha chloralose is registered with the FDA to capture waterfowl, coots, and pigeons. The use of alpha chloralose by WS was authorized by the FDA through approval under the INAD which allows use of the drug as a non-lethal form of live-capture. Alpha chloralose as a method for resolving waterfowl damage and threats to human safety are discussed in Appendix B of this EA.

National Historic Preservation Act (NHPA) of 1966, as amended

The NHPA of 1966, and its implementing regulations (see 36 CFR 800), requires federal agencies to: 1) determine whether activities they propose constitute "*undertakings*" that have the potential to cause effects on historic properties and, 2) if so, to evaluate the effects of such undertakings on historic resources and consult with the Advisory Council on Historic Preservation, as appropriate. Actions on tribal lands are only conducted at the tribe's request and under signed agreement; thus, the tribes have control over any potential conflict with cultural resources on tribal properties.

Each method described in this EA that might be used operationally by WS does not cause major ground disturbance, does not cause any physical destruction or damage to property, does not cause any alterations of property, wildlife habitat, or landscapes, and does not involve the sale, lease, or transfer of ownership of any property. In general, such methods also do not have the potential to introduce visual, atmospheric, or audible elements to areas in which they are used that could result in effects on the character or use of historic properties. Therefore, the methods that would be used by WS under the proposed action are not generally the types of activities that would have the potential to affect historic properties. If an individual activity with the potential to affect historic resources is planned under an alternative selected as a result of a decision on this EA, then site-specific consultation as required by Section 106 of the NHPA would be conducted as necessary.

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

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 Virginia's Coastal Zone Management Program.

Environmental Justice in Minority and Low-Income Populations (Executive Order 12898)

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

WS uses only legal, effective, and environmentally safe wildlife damage management methods, tools, and approaches. All chemicals used by WS and cooperating agencies are regulated by the EPA through FIFRA, VDACS, FDA, by MOUs with land managing agencies, and by WS' Directives. Based on a thorough Risk Assessment, APHIS concluded that when WS' program employs chemicals that are used according to label directions, they are selective to target individuals or populations, and such use has negligible impacts on the environment (USDA 1997). WS will properly dispose of any excess solid or hazardous waste. It is not anticipated that the proposed action would result in any adverse or disproportionate environmental impacts to minority and low-income persons or populations. In contrast, the proposed action may benefit minority or low-income populations by reducing threats to public health and safety and property damage.

Protection of Children from Environmental Health and Safety Risks (Executive Order 13045)

Children may suffer disproportionately for many reasons from environmental health and safety risks, including the development of their physical and mental status. WS and cooperating agencies makes it a high priority to identify and assess environmental health and safety risks that may disproportionately affect children. WS and cooperating agencies have considered the impacts that this proposal might have on children. The proposed activities would occur by using only legally available and approved methods where it is highly unlikely that children would be adversely affected. For these reasons, WS concludes that it would not create an environmental health or safety risk to children from implementing this proposed action. Additionally, since the proposed waterfowl damage management program is directed at reducing human health and safety risks at locations where children are sometimes present, it is expected that health and safety risks to children posed by waterfowl would be reduced.

Responsibilities of Federal Agencies to Protect Migratory Birds (Executive Order 13186)

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

Invasive Species (Executive Order 13112)

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

The Native American Graves and Repatriation Act of 1990

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

Occupational Safety and Health Act of 1970

The Occupational Safety and Health Act of 1970 and its implementing regulations (29 CFR 1910) on sanitation standards states that, "*Every enclosed workplace shall be so constructed, equipped, and maintained, so far as reasonably practical, as to prevent the entrance or harborage of rodents, insects, and other vermin. A continuing and effective extermination program shall be instituted where their presence is detected*." This standard includes birds that may cause safety and health concerns at workplaces.

Possession, Transportation, and Release of Wildlife by Authorized Persons (4 VAC 15-30-50)

Under the Virginia Administrative Code (VAC), "*...U.S. government agencies' employees whose responsibility includes fisheries and wildlife management...will be deemed to be permitted...to capture, temporarily hold or possess, transport, release, and when necessary humanely euthanize wildlife, provided that the methods of and documentation for the capture, possession, transport, release and euthanasia shall be in accordance with board policy.*

CHAPTER 2: AFFECTED ENVIRONMENT AND ISSUES

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

2.1 AFFECTED ENVIRONMENT

Waterfowl damage or threats of damage can occur statewide in Virginia where ever waterfowl occur. However, waterfowl damage management would only be conducted by WS when requested by a landowner or manager and only on properties where a cooperative service agreement or other comparable document has been signed between WS and a cooperating entity. Most species of waterfowl addressed in the assessment can be found throughout the year across the Commonwealth where suitable habitat exists for foraging, loafing, roosting, and breeding. Waterfowl are capable of utilizing a variety of habitats in the Commonwealth 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 city buildings. Waterfowl are also known to loaf, roost, and forage in similar habitat near water bodies preferring areas that are open with short vegetation which allows waterfowl to detect approaching predators. During the migration periods, waterfowl often roost on or near bodies of water but are known to travel to other areas to forage, such as agricultural fields. Since waterfowl can be found throughout the Commonwealth, requests for assistance to manage damage or threats of damage could occur in areas occupied by waterfowl.

Upon receiving a request for assistance, waterfowl damage management activities could be conducted on federal, Commonwealth, municipal, and private properties in Virginia. The areas of the proposed action could include areas in and around commercial, industrial, public, and private buildings, facilities and properties and at other sites where waterfowl may roost, loaf, feed, nest, or otherwise occur. Examples of areas where waterfowl damage management activities could be conducted are, but are not necessarily limited to: agricultural fields, farmyards, dairies, ranches, livestock operations, aquaculture facilities, fish hatcheries, golf courses, athletic fields, swimming beaches, wetlands, ponds, water impoundments, restoration sites, cemeteries, railroad yards, waste handling facilities, industrial sites, natural areas, government properties and facilities, private properties, corporate properties, schools, hospitals, parks, woodlots, recreation areas, communally-owned homeowner/property owner association properties, wildlife refuges, wildlife management areas, military bases, and airports.

2.2 ISSUES ADDRESSED IN THE ANALYSIS OF ALTERNATIVES

Issues are concerns of the public and/or professional community raised regarding potential environmental problems that might occur from a proposed action. Such issues must be considered in the NEPA decision-making process. Issues relating to the reduction of waterfowl damage were raised during the development of a prior waterfowl EA (USDA 1999), during the scoping process for WS' programmatic FEIS, and during the USFWS FEIS on the management of resident Canada geese which were considered in the preparation of this EA. Issues related to managing damage associated with waterfowl in Virginia were developed by WS and the USFWS, in consultation with the VDGIF. The EA will also be made available to the public for review and comment to identify additional issues.

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

Issue 1 - Effects on Target Waterfowl Populations

A common issue when addressing damage caused by wildlife are the potential impacts of management actions on the population of target species. Methods used to resolve damage or threats of damage can involve altering the behavior of target species and may require the use of lethal methods when appropriate. Under the proposed action, WS would incorporate non-lethal and lethal methods described in Appendix B in an integrated approach in which all or a combination of methods could be employed to

resolve a request for assistance. WS would recommend both non-lethal and lethal methods, as governed by federal, Commonwealth, and local laws and regulations.

Non-lethal methods can disperse or otherwise make an area unattractive to target species causing damage, reducing the presence of those species at the site and potentially the immediate area around the site where non-lethal methods are employed. Lethal methods would be employed to remove an individual or those individuals responsible for causing damage or posing threats of damage. The use of lethal methods would therefore result in local population reductions in the area where damage or threats were occurring. The number of target species removed from the population using lethal methods under this alternative 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.

Bird species specifically addressed in this EA include Canada geese, greater snow geese, mallards, mute swans, and domesticated waterfowl. Other species considered in this EA that may be taken in limited numbers to resolve and prevent damage and threats in the Commonwealth include the ruddy duck, wood duck, ring-necked duck, American black duck, redhead, gadwall, green-winged teal, blue-winged teal, American wigeon, Northern pintail, Northern shoveler, canvasback, greater scaup, lesser scaup, common merganser, red-breasted merganser, hooded merganser, American coot, bufflehead, Atlantic brant, common goldeneye, long-tailed duck, tundra swan, Muscovy duck, and pied-billed grebe.

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 when available. Generally, WS only receives requests for assistance with conducting damage management on species whose population densities are high and usually only after they have caused damage. WS' take is monitored by comparing numbers of animals killed with overall populations or trends in populations to assure the magnitude of take is maintained below the level that would cause significant adverse impacts to the viability of native species populations (USDA 1997). All lethal take (killing) of waterfowl by WS would occur at the requests of a cooperator seeking assistance and only after the take of waterfowl has been permitted by the USFWS pursuant to the MBTA.

WS' proposed action incorporates an adaptive approach to resolve damage and reduce threats to human safety by targeting individual waterfowl or groups of waterfowl using non-lethal and lethal methods after applying the WS' Decision Model (Slate et al. 1992, USDA 1997) to identify possible techniques. Lethal methods may be used to reinforce non-lethal methods to reduce damage to a level that is more acceptable to the requester. The effects on target waterfowl populations in the Commonwealth from implementation of the identified alternatives, including the proposed action, are analyzed in Chapter 4.

Information on bird populations and trends are often derived from several sources including the Breeding Bird Survey (BBS), the Christmas Bird Count (CBC), the Partners in Flight Landbird Population database, published literature, and harvest data. Further information on those sources of information is provided below.

Breeding Bird Survey

Bird populations can be monitored by using trend data derived from data collected during the BBS. Under established guidelines, observers count birds at established survey points for a set duration along a pre-determined route. Surveys were started in 1966 and are conducted in June which is generally

considered as the period of time when those birds present at a location are likely breeding in the immediate area. The BBS is conducted annually in the United States, across a large geographical area, under standardized survey guidelines. The BBS is a large-scale inventory of North American birds coordinated by the United States Geological Survey, Patuxent Wildlife Research Center (Sauer et al. 2008). The BBS is a combined set of over 3,700 roadside survey routes primarily covering the continental United States and southern Canada. The primary objective of the BBS has been to generate an estimate of population change for all breeding birds. Populations of birds tend to fluctuate, especially locally, as a result of variable local habitat and climatic conditions. Trends can be determined using different population equations and statistically tested to determine if a trend is statistically significant.

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

Christmas Bird Count

The CBC is conducted in December and early January annually by numerous volunteers under the guidance of the National Audubon Society. 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 over time. Researchers have found that population trends reflected in CBC data tend to correlate well with those from censuses taken by more stringent means (National Audubon Society 2002).

Partners in Flight Landbird Population Estimate

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

Annual Harvest Estimate

The populations of several migratory waterfowl species are sufficient to allow for annual harvest seasons that typically occur during the fall migration periods of those species. Migratory bird hunting seasons are established under frameworks developed by the USFWS and implemented in the Commonwealth by the VDGIF. Most of the waterfowl species addressed in this EA have established hunting seasons in the

Commonwealth. The only species addressed in the assessment that do not have established hunting seasons in the Commonwealth are mute swans, feral domestic waterfowl, Muscovy ducks, and pied-billed grebes.

Mute swans and feral domestic waterfowl are afforded no protection under the MBTA; therefore, can be addressed without the need for a depredation permit from the USFWS. Pied-billed grebes can only be addressed when take occurs through the issuance of a depredation permit issued by the USFWS. Muscovy ducks are afforded protection from take under the MBTA but can be addressed under the depredation order established by the USFWS. For Canada geese, take can also occur under several depredation orders established by the USFWS. Therefore, the take of Canada geese can occur during annual hunting seasons and under depredation orders that allows geese to be taken to alleviate damage and to alleviate threats of damage. For many migratory bird species considered harvestable during a hunting season, the number of birds harvested during the season is reported by the USFWS and/or the VDGIF in published reports.

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

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

Concerns have also been raised about the potential for adverse affects to occur to non-target wildlife from the use of chemical methods. Chemical methods being considered for use to manage damage and threats associated with birds in Virginia are further discussed in Appendix B. Chemical methods considered for use to manage damage or threat associated with waterfowl includes immobilizing drugs, reproductive inhibitors, and repellents.

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

Special efforts are made to avoid jeopardizing T&E species through biological evaluations of the potential effects and the establishment of special restrictions or minimization measures. WS has consulted with the USFWS on programmatic activities under Section 7 of the ESA concerning potential impacts of methods available for use by WS on T&E species. The USFWS issued a BO on WS' programmatic activities in 1992 (USDA 1997). As part of the scoping process and to facilitate interagency cooperation, WS' consulted with the USFWS under Section 7 during the development of this EA. This issue in relationship to the alternatives is further discussed in Chapter 4 of this EA.

Issue 3 - Effects on the Aesthetic Values of Target Waterfowl

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

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

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

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

Public attitudes toward wildlife vary considerably. Some people believe that all wildlife should be captured and relocated to another area to alleviate damage or threats to protected resources. Some people directly affected by the problems caused by wildlife strongly support removal. Individuals not directly affected by the harm or damage may be supportive, neutral, or totally opposed to any removal of wildlife from specific locations or sites. Some people totally opposed to wildlife damage management want agencies to teach tolerance for damage and threats caused by wildlife, and that wildlife should never be killed. Some of the people who oppose removal of wildlife do so because of human-affectionate bonds with individual wildlife. These human-affectionate bonds are similar to attitudes of a pet owner and result in aesthetic enjoyment. The effects on aesthetics from implementation of the identified alternatives, including the proposed action, are analyzed in Chapter 4.

Issue 4 - Humaneness and Animal Welfare Concerns of Methods

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

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

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

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

Pain and suffering, as it relates to methods available for use to manage waterfowl damage has both a professional and lay point of arbitration. Wildlife managers and the public would be better served to recognize the complexity of defining suffering, since *"…neither medical nor veterinary curricula explicitly address suffering or its relief"* (California Department of Fish and Game 1991). Research suggests that some methods can cause "*stress*" (USDA 1997). However, such research has not yet progressed to the development of objective, quantitative measurements of pain or stress for use in evaluating humaneness.

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

Additional concerns have been expressed over the potential separation of waterfowl families through management actions, primarily goose families. Generally, adult geese form pair bonds that are maintained until one of the pair dies. However, geese will form new pairs bonds even when their previous mate is still alive (MacInnes et al. 1974). Goose family units generally migrate together during the fall migration period and spend much of the fall and winter together (Raveling 1968, Raveling 1969). The separation of family units could occur during waterfowl damage management activities. This could occur through relocation of nuisance/hazardous geese or through removal and euthanasia of geese.

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

Issue 5 - Effectiveness of Damage Management Methods

The effectiveness of any damage management program could be defined in terms of losses or risks potentially reduced or prevented which can be 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. To determine that effectiveness, WS must be able to complete management actions expeditiously to minimize harm to non-target animals and the environment, while at the same time, using methods as humanely as possible within the limitations of current technology, funding, and workforce. The most effective approach to resolving any damage problem 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[6]. 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.

Based on the evaluation of the damage situation under the proposed action, the most effective methods would be employed individually or in combination based on the prior evaluations of methods or combinations of methods in other damage management situations. Once employed, methods would be further evaluated for effectiveness based on a continuous evaluation of activities by WS. Therefore, the effectiveness of methods is considered as part of the decision process for each damage management request based on continual evaluation of methods and results.

Issue 6 - Effects of Management Methods[7] on Human Health and Safety

An additional issue often raised is the potential risks associated with employing methods to manage damage caused by target species. Both chemical and non-chemical methods have the potential to have adverse affects on human safety. However, when used appropriately, the risks to human safety are low (USDA 1997). WS' methods available for use to manage damage and threats associated with waterfowl in the Commonwealth have been widely used with minimal effects to the public for decades. WS also supports the development of new methods to enhance safety, humaneness, and selectivity through continuing research at the National Wildlife Research Center (NWRC). The NWRC is the only facility in the world dedicated specifically to resolving wildlife-human conflicts.

WS' employees use and recommend only those methods which are legally available, selective for target species, and effective to resolve the wildlife conflict. Still, some concerns exist regarding the safety of

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

[7]A complete list of chemical and non-chemical methods available for use under the identified alternatives, except the alternative with no damage management (Alternative 1), can be found in Appendix B. However, listing methods neither implies that all methods will be used by WS to resolve requests for assistance nor does listing of methods imply that all methods will be used to resolve every request for assistance.

WS' methods despite their legality. As a result, WS will analyze the potential for proposed methods to pose a risk to members of the public. In addition to the potential risks to the public associated with WS' methods, risks to employees are also an issue. WS' employees are potentially exposed to damage management methods as well as subject to workplace accidents. Selection of methods includes consideration for public and employee safety.

Safety of Chemical Methods Employed

The issue of using chemicals methods as part of managing damage associated with wildlife relates to the potential for human exposure either through direct contact with the chemical or exposure to the chemical from wildlife that have been exposed. Under the alternatives identified, the use of chemical methods would be limited to immobilizing drugs, reproductive inhibitors, and repellents. Immobilizing drugs are used to sedate wildlife temporarily and lessen stress on the animal from handling and transportation from the capture site. Drugs delivered to immobilize waterfowl would occur on site with close monitoring to ensure proper care of the animal. Immobilizing drugs are fully reversible with a full recovery of sedated animals occurring, if desired. A list and description of immobilizing drugs available for use under the identified alternatives can be found in Appendix B. WS' use of chemical methods is further discussed in WS' programmatic FEIS (USDA 1997). The use of chemical methods is regulated by the EPA through the FIFRA, by the FDA, and by Commonwealth laws and regulations.

Safety of Non-Chemical Methods Employed

Non-chemical methods employed to reduce damage and threats to safety caused by waterfowl, if misused, could potentially be hazardous to human safety. Non-chemical methods are also discussed in detail in Appendix B. Of primary concern to human safety is the use of firearms and restraining devices to manage damage associated with waterfowl. The cooperator requesting assistance is also made aware through a MOU, cooperative service agreement, or a similar document that those devices agreed upon could potentially be used on property owned or managed by the cooperator. Risks to human safety associated with non-chemical methods will be evaluated in relationship to the availability of those methods under the alternatives in Chapter 4.

Effects of Not Employing Methods to Reduce Threats to Human Safety

An issue identified is the concern for human safety from not employing methods or not employing the most effective methods to reduce the threats that waterfowl can pose. The risks to human safety from diseases associated with waterfowl populations were addressed in Section 1.2 of this EA. The low risk of disease transmission from waterfowl does not lessen the concerns of cooperators requesting assistance to reduce threats from zoonotic diseases. Increased public awareness of zoonotic events has only heightened the concern of direct or indirect exposure to zoonoses. Not adequately addressing the threats associated with potential zoonoses could lead to an increase in incidences of injury, illness, or loss of human life.

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

Issue 7 - Effects on the Regulated Harvest of Waterfowl

Another issue commonly identified is a concern that waterfowl damage management activities conducted by WS would affect the ability to harvest waterfowl during the regulated waterfowl hunting by reducing

local waterfowl populations. Potential impacts could arise from the use of non-lethal or lethal damage management methods. Non-lethal methods used to reduce or alleviate damage caused by waterfowl are used to reduce the waterfowl densities through dispersal in damage management areas. Similarly, lethal methods used to reduce damage associated with waterfowl could lower waterfowl densities in areas where damage is occurring resulting in a reduction in the availability of waterfowl during the regulated harvest season. As was discussed previously, most of the waterfowl species addressed in this EA can be harvested in the Commonwealth during regulated hunting seasons. The only species that do not have hunting seasons within the Commonwealth are mute swans, feral domestic waterfowl, Muscovy ducks, and pied-billed grebes.

2.3 ISSUES CONSIDERED BUT NOT ANALYZED IN DETAIL WITH RATIONALE

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

Appropriateness of Preparing an EA for Such a Large Area

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

Lead agencies have the discretion to determine the geographic scope of their NEPA analyses (Kleppe v Sierra Club, 427 U.S. 390, 414 (1976), CEQ 1508.25). Ordinarily, according to APHIS procedures implementing the NEPA, WS' individual wildlife damage management actions may be categorically excluded (7 CFR 372.5(c)). The intent in developing this EA is to determine if the proposed action would potentially have significant individual and/or cumulative impacts on the quality of the human environment that would warrant the preparation of an EIS or a finding of no significant impact. This EA addresses impacts for managing damage and threats to human safety associated with waterfowl in the Commonwealth to analyze individual and cumulative impacts and to provide thorough analyses.

In terms of considering cumulative effects, one EA analyzing impacts for the entire Commonwealth will provide a more comprehensive and less redundant analysis than multiple EAs covering smaller areas. If a determination is made through this EA that the proposed action would have a significant impact on the quality of the human environment, then an EIS would be prepared or one of the other alternatives could be selected if determined those alternatives would meet the need for action and would not result in significant impacts. In addition, the WS program in Virginia has, and based on previous requests for assistance, will continue to only conducted waterfowl damage management in a very small area of the Commonwealth where damage is occurring or likely to occur.

A Loss Threshold Should Be Established Before Allowing Lethal Methods

One issue identified through WS' implementation of the NEPA processes is a concern that a threshold of loss should be established before employing lethal methods to resolve damage and that wildlife damage should be a cost of doing business. Some damage and economic loss can be tolerated by cooperators until the damage reaches a threshold where damage becomes an economic burden. The appropriate level of allowed tolerance or threshold before employing lethal methods would differ among cooperators and damage situations. Establishing a threshold would be difficult or inappropriate to apply to human health and safety situations. As was stated in Chapter 1, the threshold triggering a request for assistance is often unique to the individual person requesting assistance and can be based on many factors (*e.g.*, economic, social, aesthetics). Therefore, how damage is defined is often unique to the individual person and damage occurring to one individual may not be considered damage by another individual.

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

Waterfowl Damage Management Should Not Occur at Taxpayer Expense

An issue identified through the development of WS' programmatic FEIS is the concern that wildlife damage management should not be provided at the expense of the taxpayer or that activities should be fee-based (USDA 1997). Funding for waterfowl damage management activities is derived from federal appropriations and through cooperative funding. Activities conducted in the Commonwealth for the management of damage and threats to human safety from waterfowl would be funded through cooperative agreements with individual property owners or associations. A minimal federal appropriation is allotted for the maintenance of a WS program in Virginia. The remainder of the WS program is entirely fee-based. Technical assistance is provided to requesters as part of the federally-funded activities, but all direct assistance in which WS' employees perform damage management activities is funded through cooperative agreements between the requester and WS.

Cost Effectiveness of Management Methods

The CEQ does not require a formal, monetized cost benefit analysis to comply with the NEPA. Consideration of this issue is not essential to making a reasoned choice among the alternatives being considered. However, the methods determined to be most effective to reduce damage and threats to human safety caused by waterfowl and that prove to be the most cost effective would receive the greatest application. Evaluation of methods would continually occur to allow for those methods that are most effective at resolving damage or threats to be employed under similar circumstance where waterfowl are causing damage or pose a threat. Additionally, management operations may be constrained by cooperator funding and/or objectives and needs.

Effects on Human Health from Consumption of Waterfowl

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

the proposed action alternative, meat from Canada goose lethally taken during damage management activities could be donated to charitable organization for human consumption. Only meat from Canada geese would be donated under the proposed action alternative. WS could recommend the donation or consumption of meat under the technical assistance only alternative but would not be directly involved with damage management activities under that alternative.

Currently, WS is not donating any Canada geese taken in Virginia for human consumption. Geese may be processed and the meat donated for animal consumption at educational or scientific institutions (*e.g.*, wildlife veterinary centers, non-profit zoos) or geese may be disposed of according to the conditions of the migratory bird depredation permit issued by the USFWS. If WS were to donate geese for human consumption in the future, WS' policies pertaining to the testing or labeling of meat would be followed in order to address potential health concerns. Canada geese donated for human consumption may be tested for exposure to substances such as organophosphate and carbamate insecticides, lead, mercury, arsenic, organochlorines, and organic chemicals prior to distribution. The entity selecting the capture/euthanize (and donation for charitable consumption) program would be responsible for all costs associated with legal and appropriate donation for human consumption.

Geese immobilized using alpha chloralose would not be donated for human consumption with disposal of carcasses occurring by deep burial or incineration. Geese taken by any method for disease sampling or in an area where zoonotic diseases of concern are known to be prevalent and of concern to human health after consuming processed goose meat would not be donated for consumption and would be disposed of by deep burial or incineration.

WS' Impact on Biodiversity

The WS program does not attempt to eradicate any species of native wildlife in the Commonwealth. WS operates in accordance with international, federal, and Commonwealth laws and regulations enacted to ensure species viability. Methods available are employed to target individual birds or groups of birds identified as causing damage or posing a threat of damage. Any reduction of a local population or group is frequently temporary because immigration from adjacent areas or reproduction replaces the animals removed. WS operates on a small percentage of the land area in Virginia and only targets those birds identified as causing damage or posing a threat. Therefore, impacts on biodiversity associated with waterfowl damage management would not adversely affect biodiversity in the Commonwealth.

Impacts of Avian Influenza on Bird Populations

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

Recently, the occurrence of highly pathogenic (HP) H5N1 AI virus has raised concern regarding the potential impact on wild birds, domestic poultry, and human health should it be introduced into the United States. It is thought that a change occurred in a low pathogenicity AI virus of wild birds, allowing the virus to infect chickens, followed by further change into the HP H5N1 AI. HP H5N1 AI has been circulating in Asian poultry and fowl resulting in death in those species. HP H5N1 AI likely underwent further change allowing infection in additional species of birds, mammals, and humans. More recently, this virus moved back into wild birds resulting in mortality of some species of waterfowl and other birds.

This is only the second time in history that the HP form of AI has been recorded in wild birds. Numerous potential routes for introduction of the virus into the United States exist including: illegal movement of domestic or wild birds, contaminated products, infected travelers, and the migration of infected wild birds. WS has been one of several agencies and organizations conducting surveillance for AI virus in migrating birds. The nationwide surveillance effort has detected some instances of low pathogenic AI viruses, as was expected given that waterfowl and shorebirds are considered to be the natural reservoirs for AI. Tens of thousands of birds have been tested, but there has been no evidence of the HP H5N1 virus in North America. Currently, there is no evidence to suggest AI has negatively affected bird populations in North America. As stated previously, most strains of AI do not cause severe illnesses or death in bird populations.

Bird Damage Should Be Managed By Private Nuisance Wildlife Control Agents

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

Effects from the Use of Lead Ammunition in Firearms

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

The take of waterfowl by WS in the Commonwealth occurs primarily from the use of shotguns. However, the use of rifles could be employed to lethally take some species in certain situations. To reduce risks to human safety and property damage from bullets passing through birds, the use of rifles is applied in such a way (*e.g.*, caliber, bullet weight, distance) to ensure the bullet does not pass through birds. Birds that are removed using rifles would occur within areas where retrieval of all bird carcasses for proper disposal is highly likely (*e.g.*, at roost sites). With risks of lead exposure occurring primarily from ingestion of bullet fragments, the retrieval and proper disposal of bird carcasses would greatly reduce the risk of scavengers ingesting or being exposed to lead that may be contained within the carcass.

However, deposition of lead into soil could occur if, during the use of a rifle, the projectile passes through a bird, if misses occur, or if the bird carcass is not retrieved. Laidlaw et al. (2005) reported that, because of the low mobility of lead in soil, all of the lead that accumulates on the surface layer of the soil is generally retained within the top 20 cm (about 8 inches). In addition, concerns occur that lead from bullets deposited in soil from shooting activities could lead to contamination of water, either ground water or surface water, from runoff. Stansley et al. (1992) studied lead levels in water that was subjected directly to high concentrations of lead shot accumulation because of intensive target shooting at several shooting ranges. Lead did not appear to "*transport*" readily in surface water when soils were neutral or slightly alkaline in pH (*i.e.*, not acidic), but lead did transport more readily under slightly acidic

conditions. Although Stansley et al. (1992) detected elevated lead levels in water in a stream and a marsh that were in the shot "*fall zones*" at a shooting range, the study did not find higher lead levels in a lake into which the stream drained, except for one sample collected near a parking lot where it was believed the lead contamination was due to runoff from the parking lot, and not from the shooting range areas. The study also indicated that even when lead shot is highly accumulated in areas with permanent water bodies present, the lead does not necessarily cause elevated lead contamination of water further downstream. Muscle samples from two species of fish collected in water bodies with high lead shot accumulations had lead levels that were well below the accepted threshold standard of safety for human consumption (Stansley et al. 1992).

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

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

Impacts of Dispersing Waterfowl on People in Urban/Suburban Areas

Another issue often raised is that the dispersal of birds from a location to alleviate damage or conflicts at one site can result in new damage or conflicts at a new site. While the original complainant may see resolution to the bird problem when the birds are dispersed, the recipient of the birds may see the bird problem as imposed on them. Thus, on the whole, there is no resolution to the original bird problem (Mott and Timbrook 1988). Birds usually are dispersed using a combination of harassment methods including pyrotechnics, propane cannons, effigies, and electronic distress calls (Booth 1994, Avery et al.

2008, Chipman et al. 2008). A similar continuing conflict can develop when habitat alteration is used to disperse waterfowl. This concern is heightened in large metropolitan areas where the likelihood of birds dispersed from one location finding a new location and not coming into conflict is very low. WS has minimized the potential impacts of dispersing birds in urban/suburban areas by evaluating a management option to depopulate the birds creating the conflict problem.

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

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

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

The analysis in this EA was driven by the issues raised during the scoping process during the development of the EA. In addition to the analysis contained in this EA, WS' personnel use the WS Decision Model (Slate et al. 1992, USDA 1997) described in Chapter 3 as a site specific tool to develop the most appropriate strategy at each location. The WS Decision Model is an analytical thought process used by WS' personnel for evaluating and responding to waterfowl damage management requests.

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

CHAPTER 3: ALTERNATIVES

Chapter 3 contains a discussion of the alternatives which were developed to address the identified issues discussed in Chapter 2. Alternatives were developed for consideration based on the issues using the WS Decision model (Slate et al. 1992, USDA 1997), based on the scoping process in the previous EA developed to address Canada geese and domestic waterfowl (USDA 1999), and based on information in the resident Canada goose management FEIS developed by the USFWS (USFWS 2005). The alternatives will receive detailed environmental impacts analysis in Chapter 4 (Environmental Consequences). Chapter 3 also discusses alternatives considered but not analyzed in detail, with rationale. SOPs for waterfowl damage management in the Commonwealth are also discussed in Chapter 3.

3.1 DESCRIPTION OF THE ALTERNATIVES

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

Alternative 1 - No Involvement by WS in Waterfowl Damage Management in the Commonwealth

This alternative precludes any and all activities by WS to reduce threats to human health and safety, and alleviate damage to agricultural resources, property, and natural resources. WS would not be involved with any aspect of waterfowl damage management in the Commonwealth. All requests for assistance received by WS to resolve damage caused by waterfowl would be referred to the VDGIF, the USFWS, and/or other entities.

Despite no involvement by WS in resolving damage and threats associated with waterfowl in the Virginia, those persons in the Commonwealth experiencing damage caused by waterfowl could continue to resolve damage by employing those methods legally available and permitted for use. Waterfowl could continue to be lethally taken in Virginia pursuant to depredation orders or through the issuance of depredation permits by the USFWS. All methods described in Appendix B would be available for use by those persons experiencing damage or threats except for alpha chloralose which can only be used by WS.

Property owners or managers could conduct waterfowl damage management using shooting or any non-lethal method that is legally available. However, under this alternative property owners/managers may have difficulty obtaining permits to use lethal damage management methods. The USFWS needs professional recommendations on individual damage situations before issuing a depredation permit for lethal take, and the USFWS does not have the mandate or the resources to conduct wildlife damage management work. Commonwealth agencies with responsibilities for migratory birds would likely have to provide this information if depredation permits are to be issued. If the information were provided to the USFWS, following the agency's review of a complete application package for a depredation permit from a property owner or manager to lethally take waterfowl, the permit issuance procedures would follow that described in Alternative 2 and Alternative 3.

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

Alternative 2 - Addressing Waterfowl Damage by WS through Technical Assistance Only

Under this alternative, WS would provide those cooperators requesting assistance with managing damage and threats associated with waterfowl with technical assistance only. Technical assistance would provide those cooperators experiencing damage or threats associated with waterfowl with information, demonstrations, and recommendations on available and appropriate methods available. The implementation of methods and techniques to resolve or prevent damage would be the responsibility of the requester with no direct involvement by WS. In some cases, WS may provide supplies or materials that are of limited availability for use by private entities. Technical assistance could be provided through a personal or telephone consultation, or during an on-site visit with the requester. Generally, several management strategies are described to the requester for short and long-term solutions to damage problems; those strategies are based on the level of risk, need, and the practicality of their application. In some instances, wildlife-related information provided to the requestor results in tolerance/acceptance of the situation. In other instances, management options are discussed and recommended. Only those

methods legally available for use by the appropriate individual would be recommend or loaned by WS. Similar to Alternative 1, those methods described in Appendix B would be available to those experiencing damage or threats associated with waterfowl in the Commonwealth except for alpha chloralose.

The WS program in the Commonwealth regularly provides technical assistance to individuals, organizations, and other federal, Commonwealth, and local government agencies for managing waterfowl damage in the Commonwealth. Technical assistance includes collecting information about the species involved, the nature and extent of the damage, and previous methods that the cooperator has attempted to resolve the problem. WS then provides information on appropriate methods that the cooperator may consider to resolve the damage themselves. Types of technical assistance projects may include a visit to the affected property, written communication, telephone conversations, or presentations to groups such as homeowner associations or civic leagues. Since FY 2004, WS has conducted 1,447 technical assistance projects that involved waterfowl damage to agricultural resources, property, natural resources, and threats to human safety. WS has conducted projects that have primarily involved damage caused by Canada geese, snow geese, mallards, mute swans, and feral waterfowl. Technical assistance could also be provided as part of the application process for issuing a depredation permit by the USFWS under this alternative when deemed appropriate.

Those persons experiencing damage or are concerned with threats posed by waterfowl could seek assistance from other governmental agencies, private entities, or conduct damage management on their own. This alternative would place the immediate burden of operational damage management work on the resource owner and/or other governmental agencies. Those entities could implement a waterfowl damage management program using those methods legally available listed in Appendix B or could take no action. In situations where non-lethal methods are ineffective or impractical, WS would advise the property owner or manager of appropriate lethal methods to supplement non-lethal methods. In order for the property owner or manager to use lethal methods, they must apply for their own depredation permit to take waterfowl from the USFWS. WS would evaluate the damage and complete a Migratory Bird Damage Report which would include information on the extent of the damages, the number of waterfowl present, and a recommendation for the number of waterfowl that should be taken to best alleviate the damages. Following USFWS review of a complete application for a depredation permit from a property owner or manager and the Migratory Bird Damage Report, a depredation permit could be issued to authorize the lethal take of a specified number of waterfowl.

Alternative 3 - Continuing the Current Integrated Approach to Managing Waterfowl Damage (Proposed Action/No Action)

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

The adaptive approach to managing damage associated with waterfowl would integrate the use of the most practical and effective methods to resolve a request for damage management as determined by site-specific evaluation to reduce damage or threats to human safety for each request. City/town managers, agricultural producers, property owners, and others requesting assistance would be provided information regarding the use of appropriate non-lethal and lethal techniques. WS would work with those persons experiencing waterfowl damage in addressing those birds responsible for causing damage as

expeditiously as possible. To be most effective, damage management activities should begin as soon as waterfowl begin to cause damage. Waterfowl damage that has been ongoing can be difficult to resolve using available methods since those birds are conditioned to feed, roost, loaf, and are familiar with a particular location. Subsequently, making that area unattractive through the use of available methods can be difficult to achieve once damage has been ongoing. WS would work closely with those entities requesting assistance to identify situations where damage could occur and begin to implement damage management activities under this alternative as early as possible to increase the likelihood of those methods achieving the level of damage reduction requested by the cooperating entity. The USFWS could continue to issue depredation permits to WS and to those entities experiencing waterfowl damage when requested by the entity and when deemed appropriate by the USFWS for those species that require a permit.

Under this alternative, WS would respond to requests for assistance by: 1) taking no action if warranted, 2) providing only technical assistance to property owners or managers on actions they could take to reduce damages caused by waterfowl, or 3) provide technical assistance and direct operational assistance to a property owner or manager experiencing damage. The take of native migratory waterfowl can only legally occur through the issuance of a depredation permit by the USFWS and only at levels specified in the permit. When applying for a depredation permit, the requesting entity submits with the application the number of waterfowl requested to be taken to alleviate the damage. Therefore, under this alternative, the USFWS could: 1) deny an application for a depredation permit when requested to alleviate waterfowl damage, 2) could issue a depredation permit at the take levels requested, or 3) could issue permits at levels below those take levels requested.

Property owners or managers requesting assistance would be provided with information regarding the use of effective and practical non-lethal and lethal techniques. Property owners or managers may choose to implement WS' recommendations on their own (*i.e.*, technical assistance), use contractual services of private businesses, use volunteer services of private organizations, use contractual services of WS (*i.e.*, direct operational assistance), or take no action.

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

Following USFWS review of a complete application for a depredation permit from a property owner or manager and the Migratory Bird Damage Report, a depredation permit could be issued to authorize the lethal take of a specified number of waterfowl as part of an integrated approach. Upon receipt of a depredation permit, the property owner or manager or appropriate subpermittee may commence the authorized activities and must submit a written report of their activities upon expiration of their permit. Permits may be renewed annually as needed to resolve damages. Property owners or managers could conduct management using those methods legally available. Most methods discussed in Appendix B that are available for use to manage waterfowl damage would be available to all entities.

In anticipation of damage management activities, WS would annually submit an application for a depredation permit to the USFWS estimating the maximum number of waterfowl that could be lethally taken to alleviate damage in the Commonwealth through direct operational assistance projects. The number of waterfowl anticipated to be lethally taken by WS would be based on previous requests for assistance received to manage damage associated with those species of waterfowl. Therefore, the

USFWS could: 1) deny WS' application for a depredation permit, 2) issue a depredation permit for the take of waterfowl at a level below the number requested by WS, or 3) issue a depredation permit for the number of waterfowl requested by WS.

WS' Decision Model is the implementing mechanism for a damage management program under the proposed action alternative that is adapted to an individual damage situation that allows for the broadest range of methods to be used to address damage or the threat of damage in the most effective, most efficient, and mostly environmentally conscious way available. When a request for direct operational assistance is received to resolve or prevent damage caused by waterfowl, WS conducts site visits to assess damage or threats, identifies the cause of the damage, and applies the decision model described by Slate et al. (1992) and in WS' programmatic FEIS (USDA 1997) to apply methods to resolve or prevent damage using those methods available. The use of the Decision model by WS' employees under the proposed action is further discussed below.

Non-lethal methods include, but are not limited to: habitat/behavior modification, lure crops, visual deterrents, dogs, live traps, exclusionary devices, frightening devices, nest/egg destruction, chemical immobilization, and chemical repellents (see Appendix B for a complete list and description of potential methods). Lethal methods considered by WS include: live-capture followed by euthanasia, the recommendation of take during hunting seasons, and shooting. However, listing methods neither implies that all methods would be used or recommended by WS to resolve requests for assistance nor does listing of methods imply that all methods would be used to resolve every request for assistance. Euthanasia of live-captured birds would occur through the use of cervical dislocation or carbon dioxide once birds are live-captured using other methods. Carbon dioxide is an acceptable form of euthanasia for birds while cervical dislocation is a conditionally acceptable[8] method of euthanasia (AVMA 2007). The use of firearms could also be used to euthanize birds live-captured and is considered a conditionally acceptable method for free-ranging wildlife (AVMA 2007). Alternatively, Canada geese could be live captured and taken to a meat processing facility, to be euthanized and processed at that facility for food donation.

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

Non-lethal methods can disperse or otherwise make an area unattractive to waterfowl causing damage; thereby, reducing the presence of birds at the site and potentially the immediate area around the site where non-lethal methods are employed. Non-lethal methods would be given priority when addressing requests for assistance (WS Directive 2.101). However, non-lethal methods would not necessarily be employed to resolve every request for assistance if deemed inappropriate by WS' personnel using the WS Decision Model, especially when the requesting entities has used non-lethal methods and found those methods to be inadequate to resolving the damage or threats of damage. Non-lethal methods are used to exclude, harass, and disperse target wildlife from areas where damage or threats are occurring. When effective, non-lethal methods would disperse birds from the area resulting in a reduction in the presence of those birds at the site where those methods were employed. The use of non-lethal methods in an integrated approach has proved effective in dispersing birds. Non-lethal methods are generally regarded as having minimal impacts on overall populations of wildlife since those species are unharmed. The continued use of non-lethal methods often leads to the habituation of birds to those methods which can decrease the effectiveness of those methods (Avery et al. 2008, Chipman et al. 2008). For any management methods employed, the proper timing is essential in effectively dispersing those birds causing damage. Employing

[8]The AVMA (2007) defines conditional acceptable as "...[methods] *that by the nature of the technique or because of greater potential for operator error or safety hazards might not consistently produce humane death or are methods not well documented in the scientific literature".*

methods soon after damage begins or soon after threats are identified increases the likelihood that those damage management activities would achieve success in addressing damage. Therefore, coordination and timing of methods is necessary to be effective in achieving expedient resolution of bird damage.

Lethal methods would be employed to resolve damage associated with those birds identified by WS as responsible for causing damage or threats to human safety only after receiving a request for the use of those methods. The use of lethal methods would result in local population reductions in the area where damage or threats were occurring since birds would be removed from the population. Lethal methods are often employed to reinforce non-lethal methods and to remove those birds that have been identified as causing damage or posing a threat to human safety. The use of lethal methods would result in local reductions of waterfowl in the area where damage or threats were occurring. The number of birds removed from the population using lethal methods under the proposed action would be dependent on the number of requests for assistance received, the number of birds involved with the associated damage or threat, and the efficacy of methods employed. Under the proposed action, the lethal methods being considered are shooting with firearms, the live-capture of birds that are subsequently euthanized, and the recommendation of hunting as a population management tool.

Most lethal methods are intended to reduce the number of birds present at a location since a reduction in the number of birds at a location leads to a reduction in damage which is applicable whether using lethal or non-lethal methods. The intent of non-lethal methods is to harass, exclude, or otherwise make an area unattractive to birds which disperses those birds to other areas which leads to a reduction in damage at the location where those birds were dispersed. The intent of using lethal methods is similar to the objective trying to be achieved when using non-lethal methods which is to reduce the number of birds in the area where damage is occurring which can lead to a reduction in the damage occurring at that location.

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

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

Therefore, the use of both lethal and non-lethal methods may require repeated use of those methods. The return of waterfowl to areas where damage management methods were previously employed does not indicated previous use of those methods were ineffective since the intent of those methods are to reduce the number of waterfowl present at a site where damage is occurring at the time those methods are employed.

Most lethal and non-lethal methods currently available provide only short-term benefits when addressing waterfowl damage. Those methods are intended to reduce damage occurring at the time those methods are employed but do not necessarily ensure birds would not return once those methods are discontinued or the following year when birds return. Long-term solutions to resolving waterfowl damage are often

difficult to implement and can be costly. In some cases, long-term solutions involve exclusionary devices, such as wire grids, or other practices such as allowing vegetation to reach a certain height. When addressing bird damage, long-term solutions generally involve modifying existing habitat or making conditions to be less attractive to birds. To ensure complete success, alternative sites in areas where damage is not likely to occur are often times required to achieve complete success in reducing damage and avoid moving the problem from one area to another. Modifying a site to be less attractive to waterfowl would likely result in the dispersal of those birds to other areas where damage could occur or could result in multiple occurrences of damage situations.

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

Appendix B contains a thorough discussion of the methods available for use in an integrated damage management approach to address requests for assistance to manage damage or reduce threats to human safety. WS' programmatic FEIS contains additional discussion on adaptive management using an integrated approach to address damage to resources and threats to human safety (USDA 1997). As part of an integrated approach, WS may provide technical assistance and direct operational assistance to those experiencing damage associated with waterfowl.

Technical Assistance Recommendations

Under the proposed action, WS would provide technical assistance to those requesting waterfowl damage management as part of an integrated approach to managing damage. Technical assistance would occur as described in Alternative 2 of this EA. Technical assistance is further discussed in WS' programmatic FEIS (USDA 1997).

Operational Damage Management Assistance

Operational damage management assistance includes damage management activities that are directly conducted or supervised by personnel of WS. Operational damage management assistance may be initiated when the problem cannot effectively be resolved through technical assistance alone and there is a cooperative service agreement between WS and the entity requesting assistance. The initial investigation defines the nature, history, and extent of the problem; species responsible for the damage; and methods available to resolve the problem. The professional skills of WS' personnel are often required to effectively resolve problems, especially if restricted-use chemicals are necessary or if the problems are complex.

To address the anticipated needs of all property owners/managers with waterfowl damages in the Commonwealth that may request WS' assistance with lethal methods to alleviate their damages, WS would submit an application for a one-year depredation permit to the USFWS estimating the maximum number of waterfowl of each species to be lethally taken as part of an integrated approach. WS would not submit a Migratory Bird Damage Report for their own application. The USFWS would conduct an independent review of the application, and if acceptable, issue a permit as allowed under the depredation permit regulations. WS could request an amendment of their permit to increase the number of waterfowl that would be taken to address unpredicted and emerging waterfowl damages/conflicts. Each year, WS would submit an application for renewal of their permit, and through the use of Adaptive Management principles, would adjust numbers of waterfowl to meet anticipated needs, based upon management actions

in the previous year and anticipated damages and conflicts in the next year. The USFWS would review these applications annually, and issue permits as allowed by regulations. All alterations in the number of animals to be taken will be checked against the impacts analyzed in this EA. All management actions by WS would comply with appropriate federal, Commonwealth, and local laws.

Educational Efforts

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

Research and Development

The NWRC functions as the research arm of WS by providing scientific information and development of methods for wildlife damage management that are effective and environmentally responsible. Research biologists with the NWRC work closely with wildlife managers, researchers, and others to develop and evaluate wildlife damage management techniques. Biologists with the NWRC have authored hundreds of scientific publications and reports, and are respected world-wide for their expertise in wildlife damage management.

WS' Decision Making Procedures

WS' personnel use a thought process for evaluating and responding to damage complaints which is depicted by the WS Decision Model (WS Directive 2.201) and described by Slate et al. (1992). WS' programmatic FEIS provides further discussion and examples of how the Decision Model is used to address damage and threats associated with wildlife (USDA 1997). WS' personnel are frequently contacted after requesters have tried or considered non-lethal methods and found them to be impractical, too costly, or inadequate for effectively reducing damage. WS' personnel assess the damage situation after receiving a request for assistance then evaluate the appropriateness and availability (legal and administrative) of strategies and methods based on biological, economic, and social considerations. Following this evaluation, methods deemed to be practical for the situation are incorporated into a management strategy. After this strategy has been implemented, monitoring is conducted and evaluation continues to assess the effectiveness of the strategy. If the strategy is effective, the need for further management is ended. In terms of the WS Decision Model, most damage management efforts consist of continuous feedback between receiving the request and monitoring the results of the damage management strategy. The Decision Model is not a written documented process, but a mental problem-solving process common to most, if not all, professions, including WS and the USFWS.

Community Based Decision Making

The WS program in Virginia follows the "*co-managerial approach*" to solve wildlife damage or conflicts as described by Decker and Chase (1997). Within this management model, WS provides technical assistance regarding the biology and ecology of waterfowl and effective, practical, and reasonable methods available to the local decision maker(s) to reduce damage or threats. This includes non-lethal

and lethal methods. WS and other wildlife management agencies may facilitate discussions at local community meetings when resources are available. Resource owners and others directly affected by waterfowl damage or conflicts in the Commonwealth have direct input into the resolution of such problems. They may implement management recommendations provided by WS or others, or may request management assistance from WS, other wildlife management agencies, local animal control agencies, or private businesses or organizations.

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

Community Decision-makers

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

Private Property Decision-makers

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

Public Property Decision-makers

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

3.2 EXAMPLES OF WATERFOWL DAMAGE MANAGEMENT PROJECTS

Nest/Egg Treatments

Nest/egg treatments have been recommended as part of the technical assistance program provided by WS in the Commonwealth. Nest treatments include visiting the site during the nesting season of targeted species and removing or destroying the nest and/or eggs. Nest/egg treatment projects are most commonly conducted in public recreation areas, residential developments, golf courses, and industrial/business parks. For Canada geese, the typical egg treatment methods recommended by WS are oiling and addling. Oiling involves coating eggs with corn oil which prevents air from permeating the egg membrane, effectively destroying the embryo and preventing the egg from hatching. Treated eggs are placed intact back into the nest, where the goose will continue to incubate the eggs. Addling involves shaking eggs vigorously to dislodge the embryo from the egg wall, which destroys the embryo and prevents hatching. As with oiling, the goose will continue to incubate the non-viable eggs when they are placed back into the nest intact. WS assists cooperators in obtaining authorization to treat nests/eggs by directing them to the USFWS online registration or by completing a Migratory Bird Depredation Project Report recommending that a permit is issued.

Dog Harassment

Dog harassment of Canada geese could be recommended through technical assistance or employed through direct operational assistance by the WS program in Virginia to private individuals who have the ability to use dogs and/or to acquire the services of dog handlers who are trained to harass geese. Dog harassment is most effective in areas with no water bodies or with single, small (less than two acres) water bodies. This technique often requires an ongoing program augmented with other waterfowl damage management techniques. Dog harassment projects are most commonly conducted in public recreation areas, golf courses, and industrial facilities. The procedure includes using dogs such as border collies or Labrador retrievers to chase waterfowl from an area. Dog harassment usually occurs after the nesting season but before the annual molt, and then again after the molt and into the fall.

Waterfowl Round-ups

Canada goose round-ups by WS have included using panel nets or drive/corral traps to capture resident Canada geese during the molt when geese are flightless. In the Commonwealth of Virginia, this capturing method is generally used between the last two weeks in June and the first two weeks in July. During this period, adult geese have undergone the molt of their primary feathers which prevents flight. The juveniles during this period are also flightless or unlikely to fly if the adults do not. Once the birds are captured in the traps they are humanely caught and transferred to commercial poultry crates for transportation off site. WS does not recommend the translocation of waterfowl. In addition, the Code of Virginia (4VAC15-30-10) states that *"……it shall be unlawful to take, possess, import, cause to be imported, export, cause to be exported, buy, sell, offer for sale, or liberate within the Commonwealth any wild animal unless otherwise specifically permitted by law or regulation."* Therefore, target waterfowl captured using this method are euthanized using carbon dioxide or cervical dislocation and the carcasses disposed of through donation, incineration, or burial. Alternately, captured waterfowl may be delivered to a meat processor for euthanasia and processing at that site, and then donated for human or animal consumption.

Habitat Management

Reducing the attractiveness or accessibility to a site that is receiving damage from waterfowl is often suggested to residents of the Commonwealth. This can be an easy and cost effective method for

landowners to manage damage associated with waterfowl, including Canada geese (Cooper 1998). Grass length, steep sided banks, rip-rap, pond grids, and structures placed at the edge of water are all methods that can reduce the attractiveness and accessibility of a site.

3.3 ALTERNATIVES CONSIDERED BUT NOT ANALYZED IN DETAIL WITH RATIONALE

In addition to those alternative analyzed in detail, several alternatives were identified by WS, the USFWS, and the VDGIF but will not received detailed analyses for the reasons provided. Those alternatives considered but not analyzed in detail include:

Use of Non-lethal Methods before Lethal Methods

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

Those experiencing damage often employ non-lethal methods to reduce damage or threats prior to contacting WS. Verification of the methods used would be the responsibility of WS. No standard exists to determine requester diligence in applying those methods, nor are there any standards to determine how many non-lethal applications are necessary before the initiation of lethal methods. Thus, only the presence or absence of non-lethal methods can be evaluated. The proposed action alternative (Alternative 3) described is similar to a non-lethal before lethal alternative because the use of non-lethal methods is considered before lethal methods by WS (WS Directive 2.101). Adding a non-lethal before lethal alternative and the associated analysis would not add additional information to the analyses in the EA.

Use of Lethal Methods Only

This alternative would require the use of lethal methods only to reduce threats and damage associated with waterfowl. However, non-lethal methods can be effective in preventing damage in certain instances. Under WS Directive 2.101, WS must consider the use of non-lethal methods before lethal methods. In those situations where damage could be alleviated using exclusionary devices or other non-lethal methods deemed effective, those methods would be employed or recommended as determined by the decision model of WS. Therefore, this alternative was not considered in detail.

Use of Non-lethal Methods Only

Under this alternative, WS would be required to implement non-lethal methods only to resolve damage caused by waterfowl in Virginia. Only those methods discussed in Appendix B that are considered non-lethal would be employed by WS. No lethal take of birds would occur by WS. The use of lethal methods could continue to be used under this alternative by those experiencing damage by waterfowl. Exclusionary devices can be effective in preventing access to resources in certain circumstances. Exclusion is most effective when applied to small areas to protect high value resources. However, exclusionary methods are neither feasible nor effective for protecting human safety, property, or agriculture resources from waterfowl across large areas. The non-lethal methods used or recommended by WS under this alternative would be identical to those identified in any of the alternatives.

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

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

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

Trap and Translocate Waterfowl Only

Under this alternative, all requests for assistance would be addressed using live-capture methods or the recommendation of live-capture methods. Birds would be live-captured using live-traps, cannon nets, rocket nets, or chemical immobilization. All birds live-captured through direct operational assistance by WS would be translocated. Translocation sites would be identified and have to be approved by the USFWS, the VDGIF, and/or the property owner where the translocated birds would be placed prior to live-capture and translocation. Live-capture and translocation could be conducted as part of the alternatives analyzed in detail. However, the translocation of waterfowl could only occur under the authority of the USFWS and/or VDGIF. Therefore, the translocation of birds by WS would only occur as directed by those agencies. When requested by the USFWS and/or the VDGIF, WS could translocate birds under any of the alternatives analyzed in detail. Since WS does not have the authority to translocate birds in the Commonwealth unless permitted by the USFWS and/or the VDGIF, this alternative was not considered in detail.

Translocation of birds causing damage to other areas following live-capture generally would not be effective or cost-effective. Translocation is generally ineffective because problem bird species are highly mobile and can easily return to damage sites from long distances, habitats in other areas are generally already occupied, and translocation would most likely result in bird damage problems at the new location. Also, hundreds or thousands of birds would need to be captured and translocated to solve some damage problems; therefore, translocation would be unrealistic. Translocation of wildlife is also discouraged by WS policy (WS Directive 2.501) because of stress to the translocated animal, poor survival rates, and difficulties in adapting to new locations or habitats (Nielsen 1988). The VDGIF generally does not recommend translocating waterfowl species that are causing damage (T. Bidrowski, VDGIF, pers. comm. 2009). Consequently, WS would not relocate waterfowl captured during direct operational assistance unless requested by the VDGIF and when permitted by the USFWS.

Reducing Damage by Managing Waterfowl Populations through the Use of Reproductive Inhibitors

Under this alternative, the only method available to resolve requests for assistance would be the recommendation and the use of reproductive inhibitors to reduce or prevent reproduction in waterfowl

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

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

Although male Canada geese have been successfully sterilized to prevent production of young, this method is only effective if the female does not form a bond with a different male. In addition, vasectomies can only prevent the production of the mated pair. The ability to identify breeding pairs for isolation and to capture a male bird for vasectomization becomes increasingly difficult as the number of birds increase (Converse and Kennelly 1994). Geese have a long life span once they survive their first year (Cramp and Simmons 1977, Allan et al. 1995); leg-band recovery data indicate that some waterfowl live longer than 20 years. The sterilization of resident geese would not reduce the damage caused by the overabundance of the goose population since the population would remain relatively stable for many years. Keefe (1996) estimated sterilization of a Canada goose to cost over $100 per bird.

Population modeling indicates that reproductive control is more efficient than lethal control only for some rodent and small bird species with high reproductive rates and low survival rates (Dolbeer 1998). Additionally, the need to treat a sufficiently large number of target animals, multiple treatments, and population dynamics of free-ranging populations place considerable logistic and economic constraints on the adoption of reproduction control technologies as a wildlife management tool for some species. Currently, no reproductive inhibitors are available for use to manage most waterfowl populations. Given the costs associated with live-capturing and performing sterilization procedures on birds and the lack of availability of chemical reproductive inhibitors for the management of most waterfowl populations, this alternative was not evaluated in detail. If a reproductive inhibitor becomes available to manage a large number of waterfowl populations and has proven effective in reducing local bird populations, the use of the inhibitor could be evaluated under the proposed action as a method available that could be used in an integrated approach to managing damage. This EA would be reviewed and supplemented to the degree necessary to evaluate the use of the reproductive inhibitor as part of an integrated approach described under the proposed action. Currently, the only reproductive inhibitor registered with the EPA is nicarbazin which is registered for use on Canada geese, feral domestic waterfowl, domestic Muscovy ducks, and pigeons. However, products containing the active ingredient nicarbazin for managing reproduction in Canada geese, feral domestic waterfowl, and domesticated Muscovy ducks were not registered for use in Virginia at the time this EA was developed.

The use of animal drugs (including reproductive inhibitors) on vertebrate wildlife in Virginia is prohibited under § 29.1-508.1, except under written authorization from the VDGIF Director or as otherwise outlined in the law. Additionally, a permit from the USFWS would be necessary to implement reproductive control on migratory waterfowl. Currently, aside from the scientific collecting permit, there is no permit mechanism available for operational reproductive control of waterfowl (C. Dwyer, USFWS pers. comm. 2010).

Compensation for Bird Damage

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

3.4 STANDARD OPERATING PROCEDURES

SOPs improve the safety, selectivity, and efficacy of wildlife damage management activities. The current WS program, nationwide and in Virginia, uses many such SOPs which are discussed in detail in Chapter 5 of WS' programmatic FEIS (USDA 1997). Those SOPs would be incorporated into activities conducted by WS when addressing waterfowl damage and threats.

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

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

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

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

- WS consults with the USFWS and the VDGIF to ensure activities do not jeopardize the existence of T&E species. Reasonable and prudent alternatives and measures are established through consultation with the USFWS and the VDGIF and implemented to avoid adverse impacts to T&E species, when appropriate.

- All personnel who use chemical methods are trained and certified to use such substances or are supervised by trained or certified personnel.

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

- The use of non-lethal methods is considered prior to the use of lethal methods when managing waterfowl damage in accordance with WS' Directives.

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

- WS employs methods and conducts activities for which the risk of hazards to public safety and hazard to the environment have been determined to be low according to a formal risk assessment

(USDA 1997). Where such activities are conducted on private lands or other lands of restricted public access, the risk of hazards to the public is even further reduced.

- During the use of live-capture methods, WS' personnel would be present on site to monitor the application of the method or would check those methods frequently to address any live-captured wildlife to minimize the amount of time they are restrained.

3.5 ADDITIONAL STANDARD OPERATING PROCEDURES SPECIFIC TO THE ISSUES

Issue 1 - Effects on Target Waterfowl Populations

- Lethal take of waterfowl by WS would be reported and monitored by WS, by the USFWS, and the VDGIF to evaluate population trends and the magnitude of WS' take of waterfowl in the Commonwealth.

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

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

- WS would annually monitor waterfowl damage management activities to ensure activities do not adversely affect waterfowl populations in the Commonwealth.

- Preference is given to non-lethal methods, when practical and effective. If practical and effective non-lethal control methods are not available or haven proven to be ineffective and if lethal control methods are available and appropriate for WS to implement, WS may implement lethal methods.

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

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

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

- Personnel would use lures, trap placements, and capture devices that are strategically placed at locations likely to capture a target animal and minimize the potential of non-target animal captures.

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

- Personnel would be present during the use of all live-capture methods for waterfowl or those methods would be checked frequently to ensure non-target species are released immediately or are prevented from being captured.

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

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

- The USFWS and VDGIF would be notified if federally or Commonwealth listed T&E species, respectively, are unintentionally captured or killed by WS.

Issue 3 - Effects on the Aesthetic Values of Target Waterfowl

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

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

- Mute swans, Muscovy ducks, and feral domestic waterfowl are a non-native, invasive species in the Commonwealth that can cause harm to native flora and fauna. Any reduction in those populations could be viewed as benefiting the aesthetic value of a more native ecosystem.

- Preference is given to non-lethal methods, when practical and effective under WS Directive 2.101. If practical and effective non-lethal control methods are not available and if lethal control methods are available and appropriate for WS to implement, WS may implement lethal methods.

Issue 4 - Humaneness and Animal Welfare Concerns of Methods

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

- WS' personnel would be present during the use of all live-capture methods or would check those methods frequently to ensure waterfowl captured would be addressed in a timely manner to minimize the stress of being restrained.

- WS' use of euthanasia methods would follow those recommended by WS' directives (WS Directive 2.505) and the AVMA (AVMA 2007).

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

Issue 5 - Effectiveness of Damage Management Methods

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

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

Issue 6 - Effects of Management Methods on Human Health and Safety

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

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

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

- All chemical methods used by WS or recommended by WS would be registered with the FDA, EPA, and/or the VDACS.

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

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

Issue 7 - Effects on the Regulated Harvests of Waterfowl

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

- WS' activities to manage damage and threats caused by waterfowl would be coordinated with and under permits issued by the USFWS and/or the VDGIF.

- WS' lethal take (killing) of waterfowl would be reported to and monitored by the USFWS and the VDGIF to ensure WS' take is considered as part of management objectives for waterfowl in the Commonwealth.

- WS would annually monitor waterfowl damage management activities to ensure activities do not adversely affect waterfowl populations in the Commonwealth.

CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

Chapter 4 provides information needed for making informed decisions in selecting the appropriate alternative to address the need for action described in Chapter 1 and the issues described in Chapter 2. This chapter analyzes the environmental consequences of each alternative as those alternatives relate to the issues identified. The following resource values within the Commonwealth of Virginia 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.

4.1 ENVIRONMENTAL CONSEQUENCES FOR ISSUES ANALYZED IN DETAIL

This section analyzes the environmental consequences of each alternative in comparison to determine the extent of actual or potential impacts on the issues. Therefore, the proposed action/no action alternative serves as the baseline for the analysis and the comparison of expected impacts among the alternatives. The analysis also takes into consideration mandates, directives, and the procedures of WS and cooperating agencies.

Issue 1 - Effects on Target Waterfowl Populations

A common issue is whether damage management actions would adversely affect the viability of the target species population. Many waterfowl species are considered harvestable with annual hunting seasons occurring in the Commonwealth under frameworks established by the USFWS and implemented by the VDGIF. In addition, waterfowl can be lethally taken through the issuance of depredation permits and through depredation orders established by the USFWS. Therefore, the take of waterfowl can occur during annual hunting seasons and under depredation permits or orders that allow those species to be taken to alleviate damage and threats of damage. Previous requests for assistance to address damage and threats associated with free-ranging domestic or feral waterfowl have occurred in urban areas or within city limits. Since most free-ranging or feral waterfowl are non-migratory and often do not move far from water sources, harvest of those waterfowl is unlikely to occur given the restriction of firearms use in urban areas and within city limits.

WS maintains ongoing contact with USFWS and the VDGIF and submits annual migratory bird activity reports. The USFWS monitors the total take of waterfowl from all sources and factors in survival rates from predation, disease, and other mortality data. Ongoing contact with the USFWS and the VDGIF assures local, Commonwealth, and regional knowledge of wildlife population trends are considered. As discussed previously, the need for action discusses damage and threats associated with waterfowl.

The analysis for magnitude of impact from lethal take can be determined either quantitatively or qualitatively. Quantitative determinations are based on population estimates, allowable harvest levels, and actual harvest data. Qualitative determinations are based on population trends and harvest trend data. Information on bird populations and trends are often derived from several sources including the BBS, the CBC, the Partners in Flight Landbird Population database, published literature, and harvest data.

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

Alternative 1 - No Involvement by WS in Waterfowl Damage Management in the Commonwealth

Under this alternative, WS would not conduct waterfowl damage management activities in the Commonwealth. WS would have no direct involvement with any aspect of addressing damage caused by waterfowl and would provide no technical assistance. No take of waterfowl by WS would occur in the Commonwealth. Waterfowl could continue to be lethally taken to resolve damage and/or threats occurring through the issuance of depredation permits by the USFWS. In the case of domestic or feral waterfowl, mute swans, and Muscovy ducks, no depredation permit is required to lethally take those species of waterfowl. Pied-billed grebes could only be legally taken to alleviate damage or threats of damage through the issuance of a depredation permit by the USFWS. There is no hunting season for pied-billed grebes in the Commonwealth. Management actions taken by non-federal entities would be considered the environmental status quo.

Local waterfowl populations could decline, stay the same, or increase depending on actions taken by those persons receiving permits under the direction of the USFWS and the VDGIF. Some resource/property owners may hunt waterfowl or allow other hunters access to hunt waterfowl during the hunting season. The USFWS would continue to issue depredation permits for the take of Canada geese and other waterfowl to alleviate damage in the Commonwealth. Resource/property owners may obtain depredation permits from the USFWS and the VDGIF that allow them to lethally take waterfowl outside of the hunting season and in those areas where hunting is not allowed. Waterfowl populations could continue to increase where hunting pressure was low or when an insufficient number of waterfowl are removed under permits issued by the USFWS. Some local populations of waterfowl would temporarily decline or stabilize where hunting pressure and permitted removal activities were adequate. Some resource/property owners may take illegal, unsafe, or environmentally harmful action against local populations of waterfowl out of frustration or ignorance. While WS would provide no assistance under this alternative, other individuals or entities could conduct lethal damage management resulting in impacts similar to the proposed action.

Since depredation permits would continue to be issued to allow the take of waterfowl by those experiencing damage and waterfowl would continue to be harvested during the regulated season at the discretion of the USFWS and the VDGIF, the potential effects on the waterfowl populations in the Commonwealth would be similar among all the alternatives for this issue. Since WS' involvement in waterfowl damage management would only occur after the USFWS and the VDGIF has issued a permit for such action, WS' involvement would not be additive to take that could occur since the cooperator requesting WS' assistance could conduct waterfowl damage management activities without WS' direct involvement if permitted by the USFWS. Therefore, any actions to resolve damage or reduce threats associated with waterfowl could occur by other entities despite WS' lack of involvement under this alternative.

Alternative 2 - Addressing Waterfowl Damage by WS through Technical Assistance Only

Waterfowl populations in the Commonwealth would not be directly impacted by WS from a program implementing technical assistance only. However, persons experiencing damage or threats from waterfowl may implement methods based on WS' recommendations. Under a technical assistance only alternative, WS would recommend and demonstrate for use both non-lethal and lethal methods legally available for use to resolve waterfowl damage. Methods and techniques recommended would be based on WS' Decision Model using information provided from the requestor or from a site visit. Requestors may

implement WS' recommendations, implement other actions, or take no action. However, those requesting assistance are likely those persons that would implement damage abatement methods in the absence of WS' recommendations.

Under a technical assistance only alternative, those persons experiencing threats or damage associated with waterfowl in the Commonwealth could apply for a depredation permit from the USFWS to lethally take waterfowl despite WS' lack of direct involvement in the management action. Therefore, under this alternative the number of waterfowl lethally taken would likely be similar to the other alternatives since take could occur through the issuance of depredation permits by the USFWS. As is shown and discussed under the proposed action alternative, the USFWS has authorized and entities other than WS have resolved damage associated with waterfowl using lethal take. Therefore, the level of take occurring by other entities through the issuance of depredation permits is likely to continue to occur. WS' participation in a management action would not be additive to an action that could occur in the absence of WS' participation.

With the oversight of the USFWS through the issuance of depredation permits for the take of waterfowl and input from the VDGIF, it is unlikely that waterfowl populations would be adversely impacted by implementation of this alternative. Under this alternative, WS would not be directly involved with damage management actions and therefore, direct operational assistance could be provided by other entities, such as the VDGIF, USFWS, and/or municipal authorities. If direct operational assistance is not available from WS or other entities, it is possible that frustration caused by the inability to reduce damage and associated losses could lead to illegal take, which could lead to real but unknown effects on waterfowl populations. People have resorted to the illegal use of chemicals and methods to resolve wildlife damage issues (White et al. 1989, USDA 1997, USFWS 2001, FDA 2003). Effects and risks of illegal killing of waterfowl under this alternative would probably be similar to Alternative 1.

Alternative 3 - Continuing the Current Integrated Approach to Managing Waterfowl Damage (Proposed Action/No Action)

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

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

Non-lethal methods can disperse or otherwise make an area unattractive to waterfowl causing damage; thereby, reducing the presence of waterfowl at the site and potentially the immediate area around the site where non-lethal methods are employed. Non-lethal methods would be given priority when addressing requests for assistance (WS Directive 2.101). However, non-lethal methods would not necessarily be employed to resolve every request for assistance if deemed inappropriate by WS' personnel using the WS Decision Model. For example, if a cooperator requesting assistance, has already attempted to disperse waterfowl using non-lethal harassment methods, WS would not necessarily employ those methods again during direct operational assistance since those methods have already been proven to be ineffective in that particular situation. Non-lethal methods are used to exclude, harass, and disperse target wildlife from areas where damage or threats are occurring. When effective, non-lethal methods would disperse

waterfowl from the area resulting in a reduction in the presence of waterfowl at the site where those methods were employed. However, waterfowl responsible for causing damage or threats are moved to other areas with minimal impact on those species' populations. Non-lethal methods are not employed over large geographical areas or applied at such intensity that essential resources (*e.g.*, nesting locations, food sources) would be unavailable for extended durations or over a wide scope that long-term adverse affects would occur to a species' population. Non-lethal methods are generally regarded as having minimal impacts on overall populations of wildlife since those species are unharmed. The use of non-lethal methods would have no adverse impacts on waterfowl populations in the Commonwealth.

Lethal methods would be employed to resolve damage associated with those waterfowl identified by WS as responsible for causing damage or threats to human safety only after receiving a request and only after a permit has been issued for the take of the species by the USFWS, when required. The use of lethal methods would therefore result in local population reductions in the area where damage or threats were occurring since waterfowl would be removed from the population. Lethal methods are often employed to reinforce non-lethal methods and to remove birds that have been identified as causing damage or posing a threat to human safety. The use of lethal methods would therefore result in local reductions of waterfowl in the area where damage or threats were occurring. The number of waterfowl 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 waterfowl involved with the associated damage or threat, and the efficacy of methods employed.

The analysis for magnitude of impact on populations from the use of lethal methods 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 and usually only after they have caused damage. WS' take is monitored by comparing numbers of animals killed with overall populations or trends in populations to assure the magnitude of take is maintained below the level that would cause significant adverse impacts to the viability of native species populations (USDA 1997).

Canada Geese in Virginia

The WS program has received requests for assistance to manage damage and threats to human safety throughout the Commonwealth, where there are two behaviorally distinct types of Canada goose populations: resident and migratory. There are four primary 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. The Commonwealth of Virginia is considered part of the Atlantic Flyway Council designated for the management of migratory birds.

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

Commonwealth are resident, not migratory. Those geese reside in Virginia year round; 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). The highest concentration of breeding Canada geese in Virginia occurs in the eastern part of the Commonwealth, but birds can be observed throughout the Commonwealth (Sauer et al. 2008). Resident Canada geese primarily nest from March through May each year. In Virginia, 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). These areas provide optimal habitat for Canada geese.

In Virginia, 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).

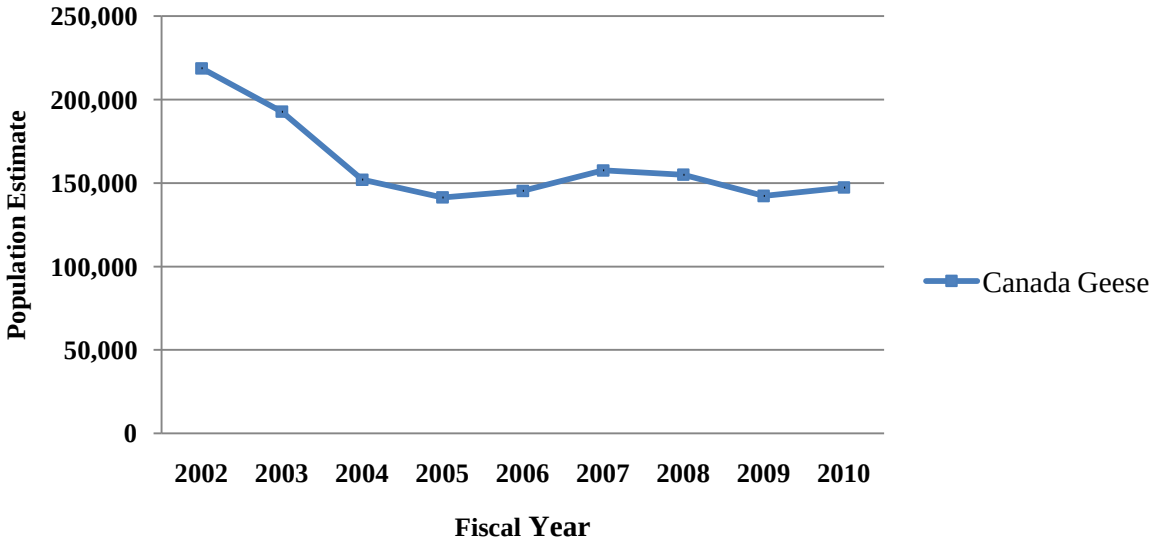
The first management plans for Canada geese in the Atlantic Flyway were developed in 1989, to help manage harvest and manage human/goose conflicts. The Atlantic Flyway Resident Canada Goose Management Plan outlines the main goals relating to Canada geese in the Atlantic Flyway. The main subject areas covered in this plan as they relate to population management focusing 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).

The USFWS and the States estimated the resident Canada goose population at 3.2 million in the United States; about 30% to 35% above the number States believe to be acceptable based on their needs to manage conflicts and problems caused by resident Canada geese (USFWS 2005). In the Atlantic Flyway, resident Canada geese consist of several subspecies that were introduced and established during the early 1900s after extirpation of native birds (Delacour 1954, Dill and Lee 1970, Pottie and Heusmann 1979, Benson et al. 1982). The spring 2010 estimate for the Atlantic Flyway resident Canada goose population was estimated over 969,000 (±180,600) geese, which was 4% fewer than the 2009 estimate (USFWS 2010) but was nearly 50% 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 Virginia have increased 15.8% per year from 1966 through 2007 (Sauer et al. 2008). The population objective for resident Canada geese in Virginia is currently set at 125,000 geese (T. Bidrowski, VDGIF, pers. comm. 2010).

The annual population estimates for resident Canada geese in the Commonwealth from 2002 through 2010 are shown in Figure 4.1. In 2002, the resident goose population in the Commonwealth was estimated at 218,719 geese (VDGIF 2010). In 2010, the resident goose population was estimated at 147,313 geese in the Commonwealth (VDGIF 2010) which exceeds the population goal of 125,000

resident geese by nearly 18%. As resident goose populations have increased across the United States, the number of requests for assistance to manage damage associated with geese has also increased (USFWS 2005). Under the selected alternative in the resident Canada goose FEIS developed by the USFWS, several mechanisms were established to allow the States to further manage resident goose populations and goose damage (USFWS 2005). An additional mechanism in place to address increasing resident goose populations was increased opportunities to address resident geese during regulated hunting seasons.

Figure 4.1 - Resident Canada goose population estimate for Virginia, 2002-2010



As mentioned previously, Canada geese can be harvested during regulated seasons in the Commonwealth. Under frameworks developed by the USFWS, the VDGIF allows Canada geese to be harvested during a September hunting season, the regular waterfowl season, and during a late Canada goose season. To manage increasing populations of resident geese across their range, the USFWS established a framework that allowed the States to implement a harvest season in September which was intended to target resident geese specifically. During the September hunting seasons in 2007 and 2008, an estimated 13,600 and 17,500 geese, respectively, were harvested statewide (Raftovich et al. 2009). In 2009, an estimated 16,800 geese were taken during the early September season in the Commonwealth (G. Costanzo, VDGIF, pers. comm. 2010). Additionally, a significant number of the birds taken during the regular harvest season and the late harvest season are resident geese and the westernmost Canada goose management zone in Virginia is primarily a resident goose zone during all harvest seasons (G. Costanzo, VDGIF, pers. comm. 2010).

In 2006, the USFWS published a final rule in the Federal Register (see 71 FR 45964) establishing regulations (see 50 CFR 20 and 50 CFR 21) to expand management opportunities to address damage from resident Canada geese. Those management opportunities included the Agricultural Depredation Order (see 50 CFR 21.51), the Control Order for Resident Geese at Airports and Military Airfields (see 50 CFR 21.49), and the Nest and Egg Depredation Order (see 50 CFR 21.50).

In 2009, the VDGIF implemented the Agricultural Depredation Order authorized by the USFWS, and began to permit agricultural producers to manage damage caused by resident geese to agricultural commodities. As outlined in the depredation order, the VDGIF may issue permits to take Canada geese at commercial agricultural facilities in the Commonwealth to reduce damage to agricultural resources. Those permits allow for unlimited take of Canada geese causing damage to commercial agriculture between May 1 and August 31 of each year. Take of resident Canada geese under this authorization must be reported to VDGIF annually, which is then reported to the USFWS. In 2009, the first year this

Agricultural Depredation Order for resident geese was available in Virginia, 38 producers were permitted to take Canada geese and their nests/eggs. Those producers destroyed 12 nests, 50 eggs were oiled, and 324 geese were taken (C. Godfrey, VDGIF, pers. comm. 2010).

The Control Order for resident geese at airports and military airfields allows airport operators to take Canada geese without a federal depredation permit from April 1 through September 15 each year to protect aviation safety within a 3-mile radius of the airfield, with landowner permission. Take under this order must be reported to the USFWS by December 31. At this time, no airports in Virginia are operating under the Order and no take has been reported (V. Slocumb, USFWS, pers. comm. 2010).

Under the Nest and Egg Depredation Order, authorized private landowners and managers of public lands can destroy resident Canada goose nests and eggs to resolve or prevent injury to people, property, agricultural crops, or other interests. Nest destruction activities may be conducted between March 1 and June 30 each year after registering with the USFWS online or obtaining a USFWS migratory bird depredation permit. From 2007 through 2009, a total of 251 registrants reported take of 444 Canada goose nests under this order in Virginia (C. Dwyer, USFWS, pers. comm. 2010). In comparison, WS reported take of 204 Canada goose nests in Virginia from FY 2007 through FY 2009.

In 2009, the population of resident Canada geese in Virginia was estimated to be approximately 142,311 geese (VDGIF 2010). In 2010, the resident Canada goose population in the Commonwealth was estimated at 147,313 geese (VDGIF 2010). Cumulative impacts of the proposed action on resident Canada geese are based upon the anticipated WS' take, hunter harvest, and authorized take by other entities (*e.g.*, agricultural producers, municipalities, homeowners associations, airports). The cumulative take of geese from known sources in the Commonwealth is shown in Table 4.1.

Table 4.1 – Cumulative Take of Canada Geese in Virginia, 2004-2009

Year	WS' Take[1]	Hunter Harvest			Depredation Take[2]	Total Take
		September	Regular	Late		
2004	2,592	17,000	23,900	14,100	3,556	**61,148**
2005	2,304	10,100	42,100	9,200	364	**64,068**
2006	2,531	11,100	21,000	15,700	2,622	**52,953**
2007	2,403	13,600	37,800	11,800	2,049	**67,652**
2008	2,046	17,500	38,000	16,800	5,676	**80,022**
2009	3,139	16,800	46,900	16,600	2,853[†]	**86,292**
TOTAL	**15,015**	**86,100**	**209,700**	**84,200**	**17,120**	**412,135**

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

[2]Data provided by the USFWS (J. Dyer, USFWS pers. comm. 2009).

[†] Data for depredation take for 2009 is not available at this time; therefore, the numbers reported for 2009 are the average of the 2004-2008 depredation take numbers.

Most requests for assistance received by WS to address damage caused by Canada geese occurs during those months when geese present in the Commonwealth 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 2009 when geese present in the Commonwealth could be geese that are not present in the Commonwealth year round. Distinguishing resident and migratory Canada geese is not possible through visual identification. However, based on those requests received and the type of damage occurring, those geese addressed by WS from FY 2004 through FY 2009 were likely resident geese (*i.e.*, present in the Commonwealth all year).

WS lethally removed a total of 15,015 Canada geese in Virginia from FY 2004 through FY 2009 which is an average of 2,503 geese taken by WS annually. As part of an integrated approach, WS also used pyrotechnics, human presence, the noise associated with the discharge of a firearm, and other non-lethal methods to disperse 46,206 geese between FY 2004 and FY 2009. Of the total number of geese addressed by WS from FY 2004 through FY 2009, nearly 76% were addressed using non-lethal methods. The highest number of geese addressed using non-lethal methods occurred in FY 2009 when 13,511 geese were dispersed using harassment methods. Of the geese addressed in FY 2009 to alleviate damage or threats of damage, over 81% were addressed using non-lethal methods.

If the statewide goose population has remained relatively stable in the Commonwealth, WS' average annual take of geese would represent 1.8% of the estimated goose population in 2009. WS' highest level of take occurred in FY2009 when 3,139 Canada geese were lethally taken to alleviate damage. With the population of geese estimated at 142,311 birds in 2009, WS' take of 3,139 geese would represent 2.2% of the estimated population. As shown in Figure 4.2, the number of resident Canada geese observed along routes surveyed in the Commonwealth from 1966 through 2007 during the BBS has shown an increasing trend (Sauer et al. 2008). The number of geese observed in the Commonwealth during the breeding season has actually increased an estimated 15.8% annually since 1966 (Sauer et al. 2008). Between 1980 and 2007, the upward trend has been estimated at 13.6% annually in the Commonwealth (Sauer et al. 2008).

From 2004 through 2009, a total of 86,100 geese were harvested in the Commonwealth during the September hunting season intended to target resident populations of Canada geese. The average number of resident Canada geese harvested in the Commonwealth during the September hunting season was 14,350 geese. The average annual harvest of geese during the September hunting season would represent 10.1% of the statewide population of geese using the 2009 goose population estimate if the population had remained relatively stable. The combined take (see Table 4.1) of Canada geese during the 2009 September hunting season, geese taken by WS in FY 2009 (3,139), and the take of geese through depredation permits (2,853; based on average of 2004-2008) was 22,792 geese. This combined take represents 16.0% of the statewide resident goose population estimate in 2009 of 142,311 geese (see Table 4.2). WS' take of 3,139 geese in FY 2009 would represent 2.2% of the resident goose population estimated in the Commonwealth during 2009. As shown in Table 4.2, the take of geese by WS, the take of geese during the September hunting season, and depredation take has ranged from a low of 9.0% of the estimated resident goose population to a high of 16.3% of the estimated population. Despite the level of take occurring, the population has remained relatively stable between 2005 and 2010 (see Figure 4.1) and continues to showing increasing trends based on BBS data (see Figure 4.2).

Table 4.2 – Potential impacts on the resident Canada goose population in Virginia from the take of resident geese, 2005 – 2009

Year	Total Take[1]	Resident Population[2]	% take of Population
2005	12,768	141,377	9.0%
2006	16,253	145,322	11.2%
2007	18,052	157,598	11.5%
2008	25,222	154,984	16.3%
2009	22,792	142,311	16.0%

[1] Total take includes WS' take, take during the September season, and take under depredation permits or orders in the Commonwealth

[2] Adapted from VDGIF 2010

As discussed previously, geese can be harvested in the Commonwealth during the regular waterfowl harvest season as well as a late goose hunting season. The number of resident geese harvested during the regular waterfowl season and the late season are unknown. To provide a range of likely resident goose

take, if geese taken during all allowed hunting seasons were resident birds, including take by WS and take through depredation permits; the take of 86,292 geese in 2009 (see Table 4.1) would represent 60.6% of the estimated resident goose population in the Commonwealth. If none of the birds taken during the regular waterfowl season in 2009 were resident geese and if none of the geese harvested during the late season in 2009 were resident geese, then the total take of geese would represent 16.0% of the estimated 2009 resident goose population in Virginia. Therefore, the take of resident geese in the Commonwealth could have been 16.0% of the estimated statewide population or could have represented up to 60.6% of estimated population of resident geese during 2009 depending on the number of resident geese harvested. The actual number of resident geese taken in 2009 by all entities lies between 16.0% and 60.6% of the estimated population of resident geese in 2009.

When compared to the total take of geese in the Commonwealth from 2004 through 2009, WS' take of Canada geese to alleviate damage has ranged from 2.6% of the total geese taken in the Commonwealth to 4.8% of the geese taken from known sources (see Table 4.1). WS' take of geese to alleviate damage has been a minor component of the total number of geese taken in the Commonwealth during the regulated harvest season and the take of geese under depredation permits or depredation orders.

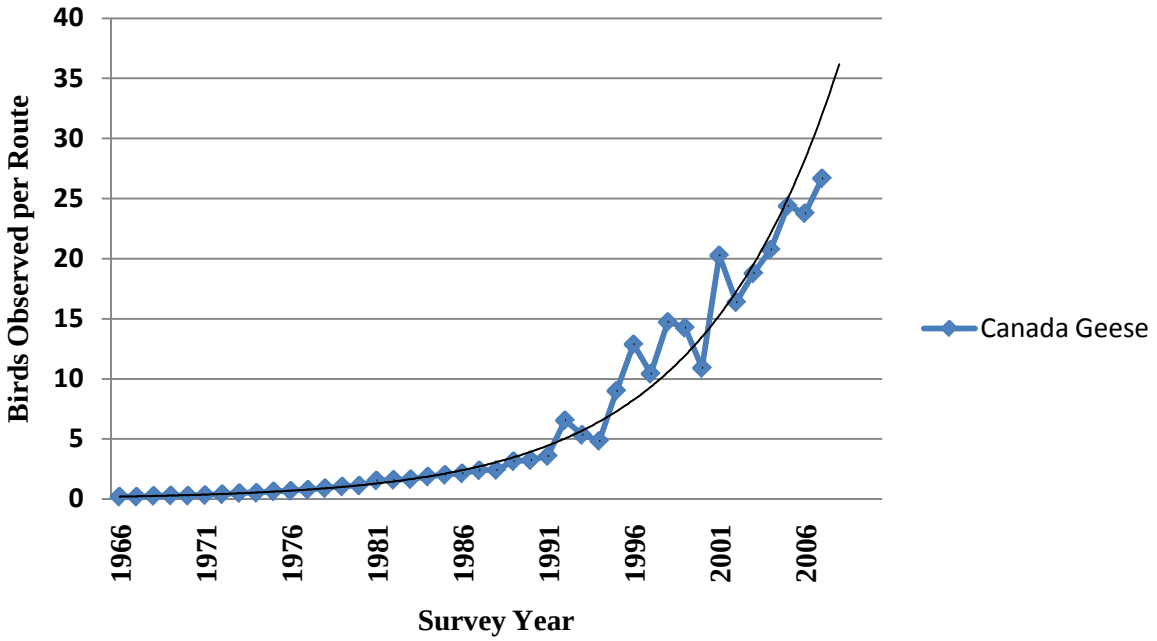
Based upon past requests for WS' assistance and in anticipation of increases in future requests for services, WS anticipates that no more than 5% of the resident Canada goose population would likely be killed by WS in Virginia annually under the proposed action. For example, based on the 2009 population of resident Canada geese, WS' take of geese in FY 2009 could have been up to 7,115 geese. Surveys are conducted annually in Virginia and along the Atlantic Flyway for many waterfowl species, including Canada geese. WS' annual take of geese by FY will be compared to the population estimate derived from survey data conducted the same calendar year (*e.g.*, the 2010 Canada goose population estimate in Virginia would be compared to WS' take that occurred in FY 2010). If Canada goose population data is not available for the Commonwealth in the calendar year corresponding to the same FY that WS' take of geese occurred, the goose population estimate from the nearest calendar year would be used to compare WS' take along with any trending data available. WS anticipates the number of requests to address damage associated with resident Canada geese would increase at airports, municipal parks, golf courses, public beaches, and other public use areas where geese congregate. Additionally, the take of resident Canada geese under the authority of the Agricultural Depredation Order and the Control Order for resident geese at airports may increase.

Under the proposed action, the nests and/or eggs of resident Canada geese could be destroyed by WS as part of an integrated approach to managing damage. Under the proposed action, up to 500 nests could be destroyed annually by WS. WS' take of nests and/or eggs would only occur when permitted by the USFWS through the issuance of depredation permits. WS' take of nests would not exceed 500 annually and would not exceed the level permitted under depredation permits. From FY 2006 through FY 2009, WS removed or destroyed a total of 301 Canada goose nests in Virginia.

Impacts due to nest and egg removal and destruction would have little adverse impact on the resident goose population in Virginia. 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. 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).

Figure 4.2 – Trend results from the Breeding Bird Survey for Canada geese in Virginia, 1966 - 2007



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

Migratory Canada Geese

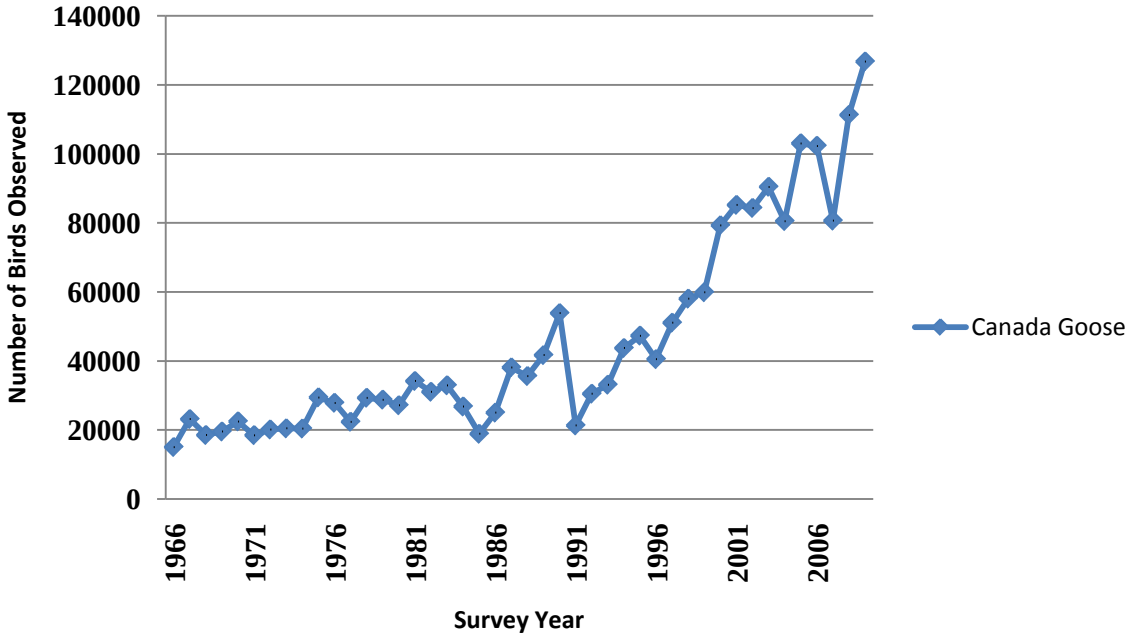
Canada geese are endemic to North America, where they occur in each State of the United States (except Hawaii), each Province of Canada, and many States of Mexico. Most authorities currently recognize 11 subspecies of Canada geese, which differ primarily in body size and color (Bellrose 1980). Canada 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, subartic, and boreal regions of Canada and Alaska and range in size from the 2-4 pound cackling Canada goose (*B.c. minima*) to the 7-10 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 2010). The wintering migratory population in Virginia is mostly comprised of geese from the AP and the SJBP. As shown in Figure 4.3, the number of Canada geese observed in the Commonwealth during the CBC has shown an increasing trend since 1966 (National Audubon Society 2002).

In 2010, the number of breeding pairs of geese for the AP was estimated to be 154,000 pairs, 13% fewer than the 2009 estimate (USFWS 2010). The total spring population of AP geese was estimated at 776,200 geese (USFWS 2010). In 2010, there were an estimated 54,600 indicated pairs (singles plus pairs) of geese in the NAP, 2% more than the 2009 estimate. Indicated pair estimates have declined an average of 2% per year since 2001 (USFWS 2010). The total NAP goose population was estimated at 156,600 geese in 2010 which represents a decrease of 13% over the 2009 estimate (USFWS 2010). The number of breeding geese in the SJBP was estimated to be 76,400 geese during the spring 2010 survey which was 10% higher than the 2009 estimate. However, the surveys of SJBP have increased an average of 2% per year since 2001 (USFWS 2010).

As discussed previously, the NAP, the AP, and the SJBP of Canada geese could be found in the Commonwealth under those conditions where geese present in the Commonwealth would be considered migratory. Migratory geese may be present in Virginia between September 26 and March 11 of each year (G. Costanzo, VDGIF, pers. comm. 2010). Under field conditions, distinguishing geese between population segments can be difficult. Determining whether a Canada goose present in the Commonwealth 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 Commonwealth from September through March will be considered as migratory geese.

Figure 4.3 - National Audubon Society Christmas Bird Count Data for Virginia, 1966-2010



Frameworks have been established by the USFWS and implemented by the VDGIF to allow for the harvest of geese in the Commonwealth during those months when geese present in the Commonwealth could be migratory. The September season is intended to manage populations of resident geese but

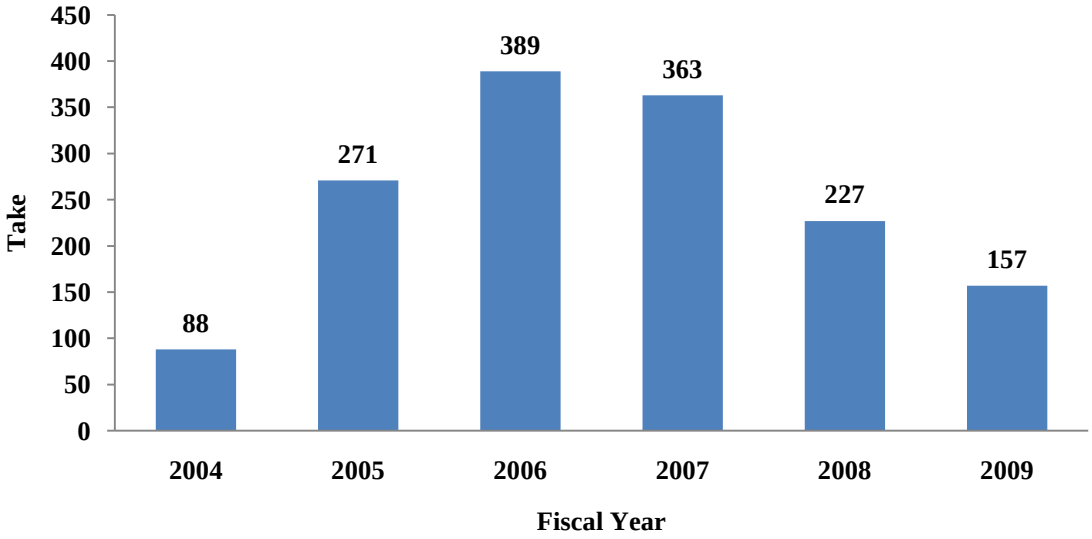
migratory geese could be present in the Commonwealth. In 2008, an estimated 54,800 geese were taken during the regular and late hunting seasons for geese in the Commonwealth (Raftovich et al. 2010). An estimated 63,500 geese were harvested in both seasons during the 2009 season (Raftovich et al. 2010).

As shown in Figure 4.4, a total of 1,495 geese were taken by WS during those months when geese present in the Commonwealth could be considered migratory which is an average of nearly 250 geese taken annually that could be migratory geese. The actual number of migratory geese taken by WS is unknown. As stated previously, many of the geese taken by WS were likely resident geese (present in the Commonwealth all year). The majority of management that may result in the take of migratory Canada geese in Virginia relates to the protection of human health and safety at airports. Canada goose management at those facilities is conducted throughout the year whenever the threat arises, and although non-lethal means are primarily used to reduce threats from Canada geese, lethal control is sometimes employed.

As the WS program in Virginia potentially expands to work with more airports, the lethal take of migrant Canada geese may also increase, but minimal lethal control combined with extensive non-lethal measures should minimize the lethal take of migrant geese. Additionally, although it is possible that geese taken between September and March are migratory Canada geese, it is more likely that those birds are resident individuals. Based on an increase in the number of requests received for the lethal take of geese during those periods of time when geese present in the Commonwealth would be considered migratory, WS may take up to 750 geese during those periods when geese could be considered migratory.

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 VDGIF. All take of geese during the hunting seasons occur under frameworks established by the USFWS. Take by other entities in the Commonwealth occurs under depredation permits or depredation orders established by the USFWS with the requirement that take be reported to the USFWS. The number of geese taken under depredation permits that could be migratory geese or are taken during those months when migratory birds could be present in the Commonwealth is unknown.

Figure 4.4 - WS' take of Canada geese that could be migratory from FY 2004 through FY 2009



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 Virginia 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 Virginia (*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 4.1, a total of 293,900 geese have been harvested from 2004 through 2009 during the regular waterfowl season and the late season in the Commonwealth when those geese present in the Commonwealth could be considered migratory. WS' take of 1,495 geese that could be migratory would represent 0.5% of the total geese taken during the regular waterfowl season and the late harvest season in the Commonwealth from 2004 through 2009.

Under the proposed action, WS could lethally take up to 750 Canada geese during the months when migrant geese may be present in the Commonwealth, based on previous requests for assistance and in anticipation of an increase in the number of requests for assistance received, primarily at airports. If the number of geese taken in the Commonwealth during the regular waterfowl season and the late harvest season are reflective of geese taken annually, the average number of geese taken in the Commonwealth during those seasons would be 48,983 geese taken annually. WS' take of up to 750 geese would represent 1.5% of the geese taken annually.

During the CBC conducted in 2010, observers counted 77,017 geese in the Commonwealth (National Audubon Society 2002). CBC data compiled since the 2001 survey conducted in the Commonwealth, indicates an average of 94,155 geese have been observed during the CBC conducted annually. If WS had lethally taken 750 migratory Canada geese, the take would have represented 0.8% of the average number of geese observed annually in the Commonwealth during the CBC conducted since 2001. Between the surveys conducted during the CBC from 2001 through 2010, the fewest number of geese counted was 80,511 geese observed in 2004 while the highest number recorded was 126,742 geese in 2009. If WS had lethally taken 750 migratory geese in 2004 and in 2009, the take would have ranged from 0.6% to 0.9% 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 Commonwealth 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 proposed by WS when compared to the number of geese observed in the Commonwealth 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 Commonwealth. Therefore, WS' proposed take of up to 750 migratory geese could be considered of low magnitude when compared with the number of geese that are harvested annually in the Commonwealth. No take of migratory geese will occur by WS without a depredation permit issued by the USFWS. Therefore, WS' take will only occur at the discretion of the USFWS after population objectives for geese are considered.

Snow Geese

Snow geese breed across the extreme northern portions of Canada and along the arctic coast (Mowbray et al. 2000). No breeding populations of snow geese occur in Virginia. However, snow geese are common migrants through Virginia with large concentrations of snow geese overwintering in the Commonwealth (Mowbray et al. 2000). The fall migration period occurs from September through November with the spring migration occurring from late February through the first part of June (Mowbray et al. 2000). The number of snow geese observed overwintering in the Commonwealth has shown cyclical patterns since 1966. The number of snow geese observed during the CBC conducted in the Commonwealth has ranged from approximately 7,400 snow geese to a high of 66,200 snow geese observed (National Audubon Society 2002). On average, 33,000 snow geese have been observed annually in the Commonwealth during the CBC (National Audubon Society 2002). During the 2010 USFWS Atlantic Flyway midwinter

survey, 16,280 snow geese were observed in Virginia (Klimstra and Padding 2010). The average number of snow geese observed in Virginia during midwinter surveys from 2006 through 2010 has been 20,503 geese (Klimstra and Padding 2010).

Like other waterfowl species, snow geese can be harvested during regulated hunting seasons, including hunting seasons in Virginia. Snow geese, like many waterfowl species can be harvested during a regular hunting season that traditionally occurs during the fall migration period of waterfowl. However, snow geese can also be harvested during their spring migration period under a Conservation Order established by the USFWS that includes Virginia (see 50 CFR 21.60) which was authorized under the Arctic Tundra Habitat Emergency Conservation Act (Public Law 106-108, Nov. 24, 1999, 113 Stat. 1491). The Conservation Order is intended to allow for the maximum number of snow geese to be taken annually in attempts to reduce the overall population of snow geese. The overall population of snow geese has increased dramatically since the mid-1970s and has reached historic highs across their breeding and wintering range. The current population level of snow geese has led to damage of fragile arctic habitats on their breeding grounds from overgrazing. The greater snow goose population is monitored on spring staging areas near the St. Lawrence Valley in Quebec, Canada. The 2009 estimate was 1,428,000 (+/- 12%), which is a 51% increase from the previous year. The population has increased at about 6% annually since 2000 (G. Costanzo, VDGIF, pers. comm. 2010).

Under current regulations in Virginia, snow geese can be harvested during a regular season which extends from October to January and during the Conservation Order season that extends from February through March. During the regular harvest season up to 15 geese can be harvested daily with no possession limit. Under the Conservation Order season, there is no daily limit on the number of snow geese that can be harvested and no possession limit (VDGIF 2010). During the 2008 snow goose harvest season, an estimated 2,184 snow geese were harvested in the Commonwealth which compares to 100 snow geese harvested during the 2009 harvest season (Raftovich et al. 2010).

Since FY 1992, WS has only lethally taken 10 snow geese in Virginia, and none have been taken since FY 2005 when five geese were taken. Requests for assistance to manage damage and threats associated with snow geese primarily originate from airports. Large flocks of snow geese on airport property or near airport property pose risks to aircraft and passenger safety due to aircraft strikes. Based upon past requests for WS' assistance and in anticipation of increases in future requests for assistance to reduce threats associated with snow geese, WS anticipates that no more than 100 snow geese could be lethally taken by WS annually under the proposed action. All take of snow geese by WS would occur only after a depredation permit has been issued by the USFWS either to WS or to the entities experiencing damage or threats of damage. If a permit was issued to an entity other than WS, WS participation in damage management activities requiring lethal take would occur as an agent of the cooperating entity under the depredation permit. Other than WS' take of snow geese, no depredation permits were issued by USFWS to take snow geese in Virginia (J. Dyer, USFWS pers. comm. 2009).

As stated previously, the number of snow geese observed during the CBC in the Commonwealth has ranged from a low of 7,400 geese to a high of nearly 66,200 geese. When compared to the number of snow geese observed in the Commonwealth during winter surveys since 1966, WS' take of up to 100 snow geese annually would have ranged from 0.2% to 1.4% of the geese observed in the Commonwealth. The average number of snow geese observed during the CBC conducted in the Commonwealth since 1966 has been 33,000 geese. WS' take of up to 100 snow geese to alleviate damage or threats would represent 0.3% of the average number of geese observed in the Commonwealth since 1966. WS' take could be considered of low magnitude when compare to the number of snow geese observed in the Commonwealth annually.

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

Mallards

The mallard is one of the most recognizable waterfowl species with a wide range across most of North America (Drilling et al. 2002). In Virginia, mallards can be found year-round throughout the Commonwealth (Drilling et al. 2002). The number of mallards observed in the Commonwealth during the BBS has increased an estimated 4.6% annually since 1966, which is a statistically significant increase (Sauer et al. 2008). In the northeastern region of the United States (USFWS Region 5), a similar trend has been observed with the number of mallards observed during the BBS increasing at a 3.8% annual rate since 1966, which is also statistically significant (Sauer et al. 2008). The number of mallards observed in the Commonwealth during the CBC has shown a general stable trend since 1966 (National Audubon Society 2002). The USFWS population estimate from the Atlantic Flyway Breeding Waterfowl Plot Survey for mallards in the Commonwealth was estimated at 49,709 (±15,275) mallards during 2009 and at 50,417 (+/- 15,747) mallards during 2010 (Klimstra et al. 2010).

Like other waterfowl species, mallards can be harvested during a regulated season in the Commonwealth. An estimated 47,541 and 58,586 mallards were harvested in the Commonwealth in 2007 and 2008, respectively (Raftovich et al. 2009). In 2009, an estimated 39,200 mallards were harvested by hunters in the Commonwealth (Klimstra and Padding 2010). From 2004 through 2009, an estimated 279,186 mallards have been harvested in the Commonwealth during the regulated season (see Table 4.3) which is an average of approximately 46,500 mallards harvested annually from 2004 through 2009. In addition to the take of mallards during the hunting season, a total of 930 mallards have been lethally taken by WS from FY 2004 through FY 2009 and another 179 mallards have been lethally taken under depredation permits to alleviate damage in the Commonwealth. From FY 2006 through FY 2009, WS also removed or destroyed eight mallard nests in Virginia. As part of an integrated approach to managing damage associated with mallards, WS also employed non-lethal methods to disperse 4,316 mallards from FY 2004 through FY 2009. Based on the total number of mallards addressed by WS from FY 2004 through FY 2009 to alleviate damage or threats of damage, over 82% of those mallards were addressed using non-lethal harassment methods. In FY 2009, WS dispersed 1,379 mallards in the Commonwealth to alleviate damage or threats of damage which compares to 282 mallards lethally taken statewide. Over 83% of the mallards addressed by WS in FY 2009 were addressed using non-lethal methods. From 2004 through 2009, the combined take by WS and the take of mallards under depredation permits have represented 0.4% of the total number of mallards taken in the Commonwealth.

Based on the number of requests received for assistance previously and in anticipation of an increase in the number of requests for assistance that would be received annually, an annual take of up to 500 mallards by WS could occur under the proposed action. In addition, up to 200 mallard nests could be destroyed by WS annually to discourage nesting in areas where mallards are causing damage or posing of a threat of damage. WS anticipates the number of airports requesting assistance with managing threats associated with mallards on or near airport property to increase. Based on the mallard population estimate derived in 2009, the take of up to 500 mallards by WS would have represented 1.0% of the estimated population. Since 2004, the average number of mallards harvested annually in the Commonwealth has been estimated at 46,531 mallards. Based on the average take of mallards from 2004

through 2009, the take of up to 500 mallards annually by WS would have represented 1.1% of the estimated take of mallards in the Commonwealth.

Table 4.3 - Take of Mallards in Virginia from 2004 through 2009

Year	WS' Take[1]	Hunter Harvest	USFWS Permitted Take[2]	TOTAL
2004	164	41,000	23	**41,187**
2005	137	53,500	5	**53,642**
2006	88	39,900	25	**40,013**
2007	113	47,000	7	**47,120**
2008	146	58,586	89	**58,821**
2009	282	39,200	30[†]	**39,512**
TOTAL	**930**	**279,186**	**179**	**280,295**

[1]WS' take data is reported by fiscal year

[2]USFWS take data is reported by calendar year

[†]2009 data is not yet available for depredation permit take; therefore, the 2009 take is the average of take reported from 2004-2008.

The destruction of up to 200 mallard nests by WS to alleviate damage or threats of damage would not reach a magnitude where adverse affects would occur based on the estimated statewide population and the number of mallards harvested annually in the Commonwealth. The destruction of nests is intended to discourage mallards from nesting in areas where damages occur or could occur. Mallards will often abandon areas where repeated nest failures occur which can effectively disperse those birds to other areas.

Based on the known take of mallards in the Commonwealth, the take of up to 500 mallards and up to 200 mallard nests annually by WS to alleviate damage would not adversely affect mallard populations in Virginia. All take by WS would occur under a depredation permit for the take of those mallards which ensure the cumulative take of mallards from all known sources is considered when establishing population objectives for mallards.

Domestic and Feral Waterfowl

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

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

Domestic waterfowl have been purchased and released by property owners for their aesthetic value, but may not always remain at the release sites; thereby, becoming feral. Feral waterfowl is defined as a domestic species of waterfowl that cannot be linked to a specific ownership. Examples of areas where domestic waterfowl have been released are business parks, universities, wildlife management areas, parks, military bases, residential communities, and housing developments. Many times, those birds are released with no regard or understanding of the consequences or problems they can cause to the environment or the local community. Virginia Law (4 VAC 15-30-40) specifically prohibits the liberation of any wild animal, which would include the release of feral waterfowl.

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

Domestic ducks, geese, and swans are non-indigenous species considered by many wildlife biologists and ornithologists to be an undesirable component of North American wild and native ecosystems. Any reduction in the number of these domestic waterfowl species could be considered a beneficial impact to other native bird species since they compete with native wildlife for resources. Domestic and feral waterfowl are almost always found near water, such as ponds, lakes, retaining pools, and waterways. Domestic and feral waterfowl generally reside in the same area year around with little to no migration occurring. Those birds are often found in areas where resident Canada geese inhabit. Currently, there are no population estimates for domestic and feral waterfowl in the Commonwealth. Domestic and feral waterfowl are not protected by federal and Commonwealth laws and are not considered for population goal requirements, including the MBTA except for certain portions of the Muscovy duck population. The Muscovy ducks located in the Commonwealth are from non-migratory populations that originated from domestic stock. The USFWS has recently changed the regulations governing Muscovy Ducks. Because Muscovy ducks now occur naturally in southern Texas, this species has been added to the list of migratory birds. However, it has been introduced and is not native in other parts of the United States, including the Commonwealth of Virginia. The USFWS now prohibits sale, transfer, or propagation of Muscovy ducks for hunting and any other purpose other than food production, and allows their removal in locations in which the species does not occur naturally in United States, including Virginia. The USFWS has revised 50 CFR 21.14 (permit exceptions for captive-bred migratory waterfowl other than mallard ducks) and 50 CFR 21.25 (waterfowl sale and disposal permits), and has added 50 CFR 21.54, an order to allow control of Muscovy ducks, their nests, and eggs.

From FY 2004 through FY 2009, the WS program in the Commonwealth has lethally taken 246 domestic or feral waterfowl to reduce damage and threats. Since FY 2004, WS has lethally taken 173 feral ducks and 73 feral geese to alleviate damage. Eleven feral duck nests have been removed or destroyed since FY 2006. Although no specific hunting season has been designated specifically for feral waterfowl, some domestic or feral waterfowl are taken in the Commonwealth during the annual hunting season for free-ranging waterfowl. The USFWS estimated 303 domestic mallards were harvested during the 2007 waterfowl hunting season with 188 domestic mallards harvested during the 2008 waterfowl hunting season (Raftovich et al. 2009). During the 2009 hunting season, an estimated 264 domestic mallards were harvested in the Commonwealth (Raftovich et al. 2010).

Based on previous requests for assistance and in anticipation of an increase in the number of requests received by WS annually, the take of up to 500 feral ducks and 200 feral duck nests, and up to 500 feral

geese and 200 feral goose nests could occur annually under the proposed action. Since feral waterfowl often compete with native wildlife species for resources, any take of feral waterfowl could be viewed as benefitting the natural environment. The number of feral waterfowl inhabiting the Commonwealth is currently unknown. However, based on the limited take proposed and the likely benefit to the natural environment that could occur, the take of up to 500 feral ducks and up to 500 feral geese would not adversely affect populations of those feral species.

Mute Swans

Mute swans are native to parts of Europe and Asia and are thought to have been introduced into the United States by private individuals in New York prior to 1900. Today, mute swan populations have expanded to include much of the northeastern United States, the Upper Great Lakes region, and the Pacific Northwest from natural dispersal and accidental release of captive birds. Mute swan populations have shown an increasing trend across their range from 1966-2007 (Sauer et al. 2008). Mute Swans often have negative impacts on the environment by consuming large quantities of submerged aquatic vegetation that are essential to native fish and wildlife species. Fenwick (1983) found that female mute swans in Chesapeake Bay consumed an average of 43% of their body weight daily while male mute swans could consume an average of 35% of their body weight daily. Thus, large concentrations of mute swans can have devastating effects on submerged aquatic vegetations beds essential to many fish, wildlife, and invertebrate species. Mute swans also aggressively defend large nesting territories that often exclude native wildlife from those areas.

Mute swans are considered a non-native species under the MBTA, as amended by the Migratory Bird Treaty Reform Act of 2004. Therefore, mute swans are afforded no protection under the Act. Mute swans are considered by many wildlife biologists and ornithologists to be an undesirable component of North American wild and native ecosystems due to their detrimental effects. Given the invasive status of mute swans, any reduction in mute swan populations, even completely removing populations, could be considered a beneficial impact to the environment since native habitats and the fish, wildlife, and invertebrates that rely on them are being negatively impacted by the presence of mute swans. Executive Order 13112 directs Federal agencies to use their programs and authorities to prevent the spread or to control populations of invasive species that cause economic or environmental harm, or harm to human health.

In 2003, the Atlantic Flyway Council adopted a Mute Swan Management Plan with the goals of reducing mute swan populations in the flyway to levels that would minimize negative impacts on wetland habitats and native waterfowl, and prevent range expansion into unoccupied areas. To minimize negative impacts on wetlands and native waterfowl, the Plan called for a reduction of the mute swan population in the Atlantic Flyway to less than 3,000 swans by 2013 (Atlantic Flyway Council 2003). During a survey conducted along the Atlantic Flyway in 2008, the population of mute swans was estimated at 10,541 swans.

In 2002, the statewide population of mute swans in Virginia was estimated at 563 swans (Atlantic Flyway Council 2003). During the mute swan survey conducted in 2008, the number of mute swans in the Commonwealth was estimated at 373 swans (Atlantic Flyway Council 2009).

Mute swans are classified by the Code of Virginia as a nuisance species (4 VAC 15-20-160) and therefore may be taken at any time (except Sunday) on private lands. The Code of Virginia (4 VAC 15-30-40) further designates mute swans as a "*predatory and undesirable species*" in that their introduction into the Commonwealth would be detrimental to the native fish and wildlife resources of Virginia. Currently, the VDGIF policy on mute swans is to prevent their establishment on public waters and to remove nuisance swans from private property at the request of the landowner (T. Bidrowski, VDGIF, pers. comm. 2009).

As with domestic and feral waterfowl, any reduction of the mute swan population in the Commonwealth, even to the extent of complete eradication from the natural environment, could be considered a beneficial impact to native waterfowl species and ecosystems. WS removed no mute swans lethally in Virginia from FY 2004 through FY 2009 though two mute swan nests were removed or destroyed.

Based on the desire to limit the expansion of mute swans and to further reduce the population in the Commonwealth, WS could be requested to remove up to 100 mute swans and 10 mute swan nests annually under the proposed action. WS' take of mute swans would likely benefit the natural environment by reducing competition with native species.

Other Waterfowl

Target species, in addition to those waterfowl species analyzed previously, have been lethally taken in small numbers by WS and have annually included no more than 50 individuals and/or 10 nests of the following waterfowl species: ruddy duck, wood duck, ring-necked duck, American black duck, redhead, gadwall, green-winged teal, blue-winged teal, American wigeon, Northern pintail, Northern shoveler, canvasback, greater scaup, lesser scaup, common merganser, red-breasted merganser, hooded merganser, American coot, bufflehead, Atlantic brant, common goldeneye, long-tailed duck, tundra swan, and pied-billed grebe. Most requests for assistance received by WS associated with those species are related to reducing threats to aircraft and enhancing aviation safety at airports.

Based on previous requests for assistance and the take levels necessary to alleviate those requests for assistance, no more than 50 individuals of any of those waterfowl species could be taken annually by WS in the Commonwealth. In addition, up to 10 nests of those species could be destroyed annually by WS in to alleviate damage or discourage nesting in areas where damages are occurring. None of those bird species are expected to be taken by WS at any level that would adversely affect populations of those species. Those waterfowl species listed are afforded protection from take under the MBTA and take is only allowed through the issuance of a depredation permit and only at those levels stipulated in the permit. Therefore, those birds would be taken in accordance with applicable Commonwealth and federal laws and regulations authorizing take of migratory birds and their nests and eggs, including the USFWS permitting processes. The USFWS, as the agency with management responsibility for migratory birds, could impose restrictions on depredation take as needed to assure cumulative take does not adversely affect the continued viability of populations. This would assure that cumulative impacts on those bird populations would have no significant adverse impact on the quality of the human environment. In addition, any take of the above species in accordance with an issued federal permit would be reported to the USFWS and VDGIF annually.

Based upon the limited lethal take proposed and with USFWS oversight, it is anticipated that none of these waterfowl species would be taken by WS at any level that would adversely affect their populations. All of those waterfowl species addressed in this section maintain sufficient population levels to allow for annual hunting seasons. The proposed annual take by WS would be a minor component of the annual harvest of those species. The limited take proposed by WS, when compared to the number of those birds harvested annually could be considered of low magnitude. The pied-billed grebe is the only species addressed in this section that cannot be harvested in the Commonwealth during the waterfowl hunting seasons. However, pied-billed grebes are not considered to be of low densities with most birds being addressed during the migration periods when the number of grebes present in the Commonwealth is highest. The USFWS and the VDGIF considers cumulative take of those species when issuing depredation permits to ensure all known mortality factors are considered when determining population objectives and allowable take levels. Therefore, the take proposed by WS would only occur when authorized by the USFWS through the issuance of depredation permits and only at level permitted.

Wildlife Disease Surveillance

As part of surveillance activities for wildlife diseases, it may be necessary for WS to obtain biological samples from various species of waterfowl (*e.g.*, a tracheal or cloacal sample taken with a cotton swab). Waterfowl sampled for disease surveillance (if not taken during wildlife damage management projects) would be captured live using non-lethal nets or traps. Captured waterfowl would be carefully and humanely restrained (usually in commercial poultry crates) and released unharmed at the capture site after the samples are obtained. There is a possibility that some waterfowl may be injured or killed by capture devices (such as rocket or cannon net assemblies). However, the threat of birds being killed or injured during disease sampling activities is expected to be very minimal to nonexistent. Most samples would involve waterfowl harvested during the waterfowl hunting seasons. Therefore, no additional take would occur outside of the take that would already have occurred from the hunting season or during damage management activities.

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

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

Alternative 1 - No Involvement by WS in Waterfowl Damage Management in the Commonwealth

Under this alternative, WS would not be directly involved with waterfowl damage management activities in the Commonwealth. Therefore, no direct impacts to non-targets or T&E species would occur by WS under this alternative. Waterfowl would continue to be taken during the regulated harvest season and under the depredation order for Canada geese and Muscovy ducks. Risks to non-targets and T&E species would continue to occur from those who implement waterfowl damage management activities on their own or through recommendations by the other federal, Commonwealth, and private entities. Although some risks occur from those persons that implement waterfowl damage management in the absence of any involvement by WS, those risks are likely low and are similar to those risks under the other alternatives.

The ability to reduce negative impacts caused by waterfowl would be variable based upon the skills and abilities of the person implementing damage management actions under this alternative. The risks to non-targets and T&E species would be similar across the alternatives since most of those methods described in Appendix B are available across the alternatives. If those methods available are applied as intended, risks to non-targets would be minimal to non-existent. If methods available are applied incorrectly or applied without knowledge of waterfowl behavior, risks to non-target wildlife would be higher under this alternative. If frustration from the lack of available assistance causes those persons experiencing waterfowl damage to use methods that are not legally available for use, risks to non-targets would be higher under this alternative. People have resorted to the use of illegal methods to resolve wildlife damage that have resulted in the lethal take of non-target wildlife (White et al. 1989, USDA 1997, USFWS 2001, FDA 2003).

Alternative 2 - Addressing Waterfowl Damage by WS through Technical Assistance Only

Under a technical assistance alternative, WS would have no direct impact on non-target species, including T&E species. Methods recommended or provided through loaning of equipment could be employed by those requesting assistance. Recommendations would be based on WS' Decision Model using information provided by the person requesting assistance or through site visits. Recommendations would

include methods or techniques to minimize non-target impacts associated with the methods being recommended or loaned. Methods recommended could include non-lethal and lethal methods as deemed appropriate by WS' Decision Model and as permitted by laws and regulations.

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

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

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

If requestors are provided technical assistance but do not implement any of the recommended actions, the potential impacts to non-targets would be lower compared to the proposed action. If those requesting assistance implement recommended methods appropriately and as instructed or demonstrated, the potential impacts to non-targets would be similar to the proposed action. Methods or techniques not implemented as recommended or used inappropriately would likely increase potential impacts to non-targets. Therefore, the potential impacts to non-targets, including T&E species would be variable under a technical assistance only alternative. It is possible that frustration caused by the inability to reduce damage and associated losses could lead to illegal killing of waterfowl, which could lead to unknown effects on local non-target species populations, including some T&E species (White et al. 1989, USDA 1997, USFWS 2001, FDA 2003).

It would be expected that this alternative would have a greater chance of reducing damage than Alternative 1 since WS would be available to provide information and advice.

Alternative 3 - Continuing the Current Integrated Approach to Managing Waterfowl Damage (Proposed Action/No Action)

The potential adverse affects to non-targets occurs from the employment of methods to address waterfowl damage in the Commonwealth. Personnel from WS are experienced and trained in wildlife identification and to select the most appropriate methods for taking targeted animals and excluding non-target species. To reduce the likelihood of capturing non-target wildlife, WS and cooperating agencies would employ the most selective methods for the target species, would employ the use of attractants that are as specific to target species as possible, and determine placement of methods to avoid exposure to non-targets. Minimization methods and SOPs to prevent and reduce any potential adverse impacts on non-targets are discussed in Chapter 3 of this EA. Despite the best efforts to minimize non-target take during program activities, the potential to disperse, live-capture, and lethal take non-target species 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 affects 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 where the methods are employed. However, like target species, the potential impacts on non-target species are expected to be temporary with target and non-target species often returning after the cessation of dispersal methods.

Other non-lethal methods available for use under this alternative include drop nets, cannon nets, rocket nets, live traps, repellents, and immobilizing drugs. The reproductive inhibitor nicarbazin is not currently registered for use in Virginia, but may become available to the public in the future. Nets are virtually selective for target individuals since activation occurs by attending personnel, with handling of wildlife occurring after deployment of the net. Therefore, any non-targets captured using nets can be immediately released on site. Any potential non-targets captured using non-lethal methods would be handled in such a manner as to ensure the survivability of the animal if released. Even though live-capture does occur from those methods, the potential for death of a target or non-target animal while being restrained or released does exist, primarily from being struck by the cannon or rocket assemblies during deployment. The likelihood of non-targets being struck is extremely low and is based on being present when the net is activated and in a position to be struck. Nets are positioned to envelop wildlife upon deployment and to minimize striking hazards. Baiting of the areas to attract target species often occurs when using nets. Therefore, sites can be abandoned if non-target use of the area is high.

Live traps (*e.g.*, cage traps, walk-in traps, corral traps) restrain wildlife once captured and are considered live-capture methods. Live traps have the potential to live-capture non-target species. Trap placement in areas where target species are active and the use of attractants as specific to the target species as possible would minimize the likelihood of capturing non-targets.

Only those repellents registered with the EPA pursuant to the FIFRA would be recommended and used by WS under this alternative. Therefore, the use and recommendation of repellents would not have negative impacts on non-target species when used according to label requirements. Most repellents for waterfowl are derived from natural ingredients that pose a very low risk to non-targets when exposed to or when ingested. Two chemicals commonly registered with the EPA as waterfowl repellents are methyl anthranilate and anthraquinone. Methyl anthranilate naturally occurs in grapes and is used to flavor food, candy, and soft drinks. Anthraquinone naturally occurs in plants like aloe and is also used to make dye. Both products claim to be unpalatable to geese and other waterfowl. Several products are registered for use to reduce waterfowl damage containing either methyl anthranilate or anthraquinone. Formulations containing those chemicals are liquids that are applied directly to susceptible resources, primarily turf. Methyl anthranilate is effective for about four days depending on environmental conditions which is a similar duration experienced when applying anthraquinone as geese continue to feed on treated areas (Cummings et al. 1995, Dolbeer et al. 1998). Dolbeer et al. (1998) found that geese tended to loaf on anthraquinone treated turf, albeit at lower abundance, but the quantity of feces on treated and untreated turf was the same, thus the risk of damage was unabated.

Immobilizing drugs are applied through hand-baiting that targets specific individuals or groups of target species. Therefore, immobilizing drugs are only applied after identification of the target occurs prior to application. Pre-baiting and acclimation of the target waterfowl occurs prior to the application of alpha chloralose which allows for the identification of non-targets that may visit the site prior to application of the bait. All unconsumed bait is retrieved after the application session has been completed. Since sedation occurs after consumption of the bait, personnel are present on site at all times to retrieve waterfowl. This constant presence by WS' personnel would allow for continual monitoring of the bait to

ensure non-targets are not present. Based on the use pattern of alpha chloralose by WS, no adverse affects to non-targets are expected from the use of alpha chloralose.

The persistent use of non-lethal methods would likely result in the dispersal or abandonment of those areas where non-lethal methods are employed of both target and non-target species. Therefore, any use of non-lethal methods has similar results on both non-target and target species. Though non-lethal methods do not result in lethal take of non-targets, the use of non-lethal methods can restrict or prevent access of non-targets to beneficial resources. Overall, potential impacts to non-targets from the use of non-lethal methods only would not adversely impact populations since those methods are often temporary.

Since nicarbazin under the tradename OvoControl® G could be commercially available to those with a certified applicators license, the use of the product could occur under any of the alternatives discussed in the EA; therefore, the effects of the use would be similar across all the alternatives if the product is used according to label instructions. Under the proposed action, WS could use or recommend nicarbazin under the trade name OvoControl® G as part of an integrated approach to managing damages associated with geese if the product becomes registered for use in Virginia. The use of nicarbazin would also require the approval of the VDGIF Director pursuant to Virginia law, § 29.1-508.1. WS' use of nicarbazin under the proposed action would not be additive since the use of the product could occur from other sources, such as private pest management companies or those experiencing damage could become a certified applicator and apply the bait themselves when the appropriate depredation permits are received.

Exposure of non-target wildlife to nicarbazin could occur either from direct ingestion of the bait by non-target wildlife or from secondary hazards associated with wildlife consuming birds that have eaten treated bait. Several label restrictions of OvoControl® G are intended to mitigate risks to non-target wildlife from direct consumption of treated bait (EPA 2005). The label requires an acclimation period that habituates geese and target waterfowl to feeding in one location at a certain time period. During baiting periods, the applicator must be present on site until all bait has been consumed. Non-target risks are further minimized by requirements that bait can only be distributed in bait pans or through broadcast application (by hand or mechanical feeders). All unconsumed bait must also be retrieved daily which further reduces threats of non-target consuming treated bait.

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

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

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

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

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

WS would also employ and/or recommend lethal methods under the proposed action alternative to alleviate damage. Lethal methods available for use to manage damage caused by waterfowl under this alternative would include the recommendation of take by private entities during the hunting season, shooting, and euthanasia after live capture. The use of firearms is essentially selective for target species since animals are identified prior to application; therefore, no adverse impacts are anticipated from use of this method. The euthanasia of waterfowl by WS' personnel would be conducted in accordance with WS Directive 2.505. Chemical methods used for euthanasia would be limited to carbon dioxide administered in an enclosed chamber after waterfowl have been live-captured. Since live-capture of waterfowl using other methods occurs prior to the administering of euthanasia chemicals, no adverse affects on non-targets would occur under this alternative. WS' recommendation that waterfowl be harvested during the regulated season by private entities to alleviate damage would not increase risks to non-targets. Shooting is essentially selective for target species and non-target take is not likely and would not increase based on WS' recommendation of the method.

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 waterfowl, the use of such methods can result in the incidental take of unintended species. Those occurrences are rare and should not affect the overall populations of any species under the current program. No lethal take of non-target species by WS has occurred in Virginia during activities to reduce damage or threats to human safety from waterfowl since methods used during those activities were selective for the target species. WS' take of non-target species in the Commonwealth is expected to be extremely low to non-existent. WS would monitor annually the take of non-target species to ensure program activities or methodologies used in waterfowl damage management do not adversely impact non-targets.

T&E Species Effects

Special efforts are made to avoid jeopardizing T&E species through biological evaluations of the potential effects and the establishment of special restrictions or mitigation measures. Mitigation measures and SOPs to avoid T&E effects are described in Chapter 3 of this EA and in WS' programmatic FEIS (USDA 1997).

Federally Listed Species - The list of species designated as threatened and endangered in the Commonwealth of Virginia as determined by the USFWS and the National Marine Fisheries Service was obtained and reviewed during the development of this EA (see Appendix C). Consultation with the USFWS under Section 7 of the ESA concerning potential impacts of WS' programmatic activities on T&E species was conducted as part of the development of WS' programmatic FEIS. WS obtained a BO from the USFWS addressing WS' programmatic activities. For the full context of the BO, see Appendix F of WS' programmatic FEIS (USDA 1997). During the development of this EA, consultation with the USFWS under Section 7 of the ESA also occurred. After review of the T&E species listed in the Commonwealth and the activities described in this EA, including consultation with cooperating agencies, the proposed action was determined to not likely adversely impact any T&E species listed in the Commonwealth of Virginia (C. Schulz, USFWS, letter to J. Cromwell, WS, August 10, 2010).

Commonwealth Listed Species - The list of T&E species designated by the Commonwealth was also obtained during the development of this EA. Based on the methods and scope of activities proposed under this alternative, activities conducted within the scope of analysis would not adversely affect any species listed as threatened and endangered in the Commonwealth of Virginia (R. Fernald, VDGIF, letter to J. Cromwell, WS, June 17, 2010).

Beneficial Effects on Non-target Species

Invasive species that are introduced into naïve environments often exploit resources and often compete with native plant and wildlife species. Competition for resources between invasive and native species has been well documented (Pimentel et al. 2000). Of major concern with resource agencies are the impacts invasive species have on T&E species. Pimentel et al. (2000) estimated 400 of the 958 species listed as threatened and endangered in the United States at the time of publication were negatively impacted by invasive species, primarily from competition for resources and predation based on published reports by The Nature Conservancy (1996) and Wilcove et al. (1998). Worldwide nearly 80% of wildlife populations at risk of extinction are threatened or negatively impacted by invasive species (Pimentel et al. 2005). Thus, invasive species have been identified as the primary cause of endangerment of at least 40% of the species listed as threatened or endangered in the United States (Wilcove et al. 1998, Pimentel et al. 2000, Pimentel et al. 2005).

The adverse impacts that mute swans and feral waterfowl can have on native flora and fauna in the Commonwealth are discussed in Chapter 1 of this EA. Any reduction in the invasive waterfowl populations in the Commonwealth could be viewed as benefiting native wildlife and habitats.

Under this alternative, WS and cooperating agencies would be allowed to implement methods to achieve the most effective approach to resolve and prevent damage to native flora and fauna in the Commonwealth. An integrated approach allows the greatest amount of flexibility in the use of methods to ensure employment of methods either individual or in combination achieves the desired level of damage or threat reduction.

Issue 3 - Effects on the Aesthetic Values of Target Waterfowl

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

Alternative 1 - No Involvement by WS in Waterfowl Damage Management in the Commonwealth

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

Since waterfowl would continue to be taken under this alternative, despite WS' lack of involvement, the ability to view and enjoy waterfowl would likely be similar to the other alternatives. The lack of WS' involvement would not lead to a reduction in the number of waterfowl dispersed or taken since WS has no authority to regulate take or the harassment of waterfowl in the Commonwealth. The USFWS and the VDGIF with management authority over waterfowl would continue to adjust all take levels based on population objectives for those species. Therefore, the number of waterfowl lethally taken annually through hunting and depredation permits are regulated and adjusted by the USFWS and the VDGIF.

Those experiencing damage or threats would continue to use those methods they feel appropriate to resolve waterfowl damage or threats, including lethal take. The impacts to the aesthetic value of waterfowl would be similar to the other alternatives.

Alternative 2 - Addressing Waterfowl Damage by WS through Technical Assistance Only

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

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

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

Alternative 3 - Continuing the Current Integrated Approach to Managing Waterfowl Damage (Proposed Action/No Action)

Under the proposed action, methods would be employed that would result in the dispersal, exclusion, or removal of individuals or small groups of waterfowl to resolve damage and threats associated with target species. In some instances where waterfowl are dispersed or removed, the ability of interested persons to observe and enjoy waterfowl would likely temporarily decline. The waterfowl populations in those areas would likely increase upon cessation of damage management activities.

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

The use of lethal methods would result in temporary declines in local populations resulting from the removal of waterfowl to address or prevent damage and threats. The goal under the proposed action is to respond to requests for assistance and to manage those waterfowl responsible for the resulting damage. Therefore, the ability to view and enjoy waterfowl in the Commonwealth would still remain if a reasonable effort is made to locate waterfowl outside the area in which damage management activities occurred.

All activities are conducted by WS where a request for assistance has been received and only after agreement for such services have been agreed upon by the cooperator. Some aesthetic value would be gained by the removal of waterfowl and the return of a more natural environment, including the return of native wildlife and plant species that may be suppressed or displaced by high densities of waterfowl. Any removal of waterfowl by WS using lethal methods in the Commonwealth would occur after the appropriate depredation permits are received from the USFWS.

WS' take of waterfowl from FY 2004 through FY 2009 has been of a low magnitude when compared to the total mortality from other sources. Although waterfowl removed by WS are no longer present for viewing or enjoying, those waterfowl would likely be taken by the property owner or manager under the depredation permit issued to the owner or manager by the USFWS, through a depredation order, or during

hunting seasons. In addition, those waterfowl could be dispersed from the areas using non-lethal methods. Given the limited take proposed by WS under this alternative when compared to the known sources of mortality of waterfowl, WS' waterfowl damage management activities conducted pursuant to the proposed action would not adversely affect the aesthetic value of waterfowl since take is of a low magnitude. The impact on the aesthetic value of waterfowl and the ability of the public to view and enjoy waterfowl under the proposed action would be similar to the other alternatives and is likely low.

Executive Order 13112 directs federal agencies whose actions may affect the status of invasive species to reduce invasion of those species and the associated damages to the extent practicable and permitted by law. All activities are conducted where a request for assistance has been received and only after agreement for such services as been agreed upon by the cooperator. Some loss of aesthetic value would be gained by the removal of an invasive species and the return of a more natural environment, including the return of native wildlife and plant species that may be suppressed or displaced by the presence of invasive mute swans, Muscovy ducks, and feral waterfowl.

Issue 4 - Humaneness and Animal Welfare Concerns of Methods

The issue of humaneness and animal welfare concerns associated with methods available for use to manage waterfowl damage has been raised. As described previously, most of those methods available for use to manage waterfowl would be available under any of the alternatives, when permitted by the USFWS and the VDGIF. The humaneness of methods available for use in Virginia, as the use of those methods relates to the alternatives, is discussed below.

Alternative 1 - No Involvement by WS in Waterfowl Damage Management in the Commonwealth

Under this alternative, the issues of the humaneness of methods would not be considered by WS. WS would have no involvement in any aspect of waterfowl damage management in the Commonwealth. Those persons experiencing damage or threats associated with waterfowl could use those methods legally available and permitted by the USFWS, the VDGIF, and federal, Commonwealth, and local regulations. Those methods would likely be considered inhumane by those persons who would consider methods proposed under any alternative as inhumane. The issue of humaneness would likely be directly linked to the methods legally available to the general public since methods are often labeled as inhumane by segments of society no matter the entity employing those methods. A method considered inhumane, would still be perceived as inhumane regardless of the person or entity applying the method. However, even methods generally regarded as being a humane method could be employed in inhumane ways if employed by those persons inexperience in the use of those methods or if those persons are not as diligent in attending to those methods.

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

humane methods inhumanely under this alternative based on a lack of assistance is difficult to determine and could just as likely be similar across the alternatives.

Alternative 2 - Addressing Waterfowl Damage by WS through Technical Assistance Only

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

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

Those requesting assistance would be directly responsible for the use and placement of methods and if monitoring or checking of those methods does not occur in a timely manner, captured wildlife could experience suffering and if not address timely, could experience distress. The amount of time an animal is restrained under the proposed action would be shorter compared to a technical assistance alternative if those requestors implementing methods are not as diligent or timely in checking methods. Similar to Alternative 1, it is difficult to evaluate the behavior of individual people and what may occur under given circumstances. Therefore, only the availability of WS' assistance can be evaluated under this alternative since determining human behavior can be difficult. If those persons seeking assistance from WS apply methods recommended by WS through technical assistance as intended and as described by WS, then those methods would be applied as humanely as possible to minimize pain and distress. If those persons provided technical assistance by WS apply methods not recommended by WS or do not employ methods as intended or without regard for humaneness, then the issue of method humaneness would be of greater concern since pain and distress of waterfowl would likely be higher.

Alternative 3 - Continuing the Current Integrated Approach to Managing Waterfowl Damage (Proposed Action/No Action)

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

As discussed in Chapter 2, humaneness, in part, appears to be a person's perception of harm or pain inflicted on an animal. People may perceive the humaneness of an action differently. The challenge in

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

Some methods have been stereotyped as "*humane*" or "*inhumane*". However, many "*humane*" methods can be inhumane if not used appropriately. For instance, a cage trap is generally considered by most members of the public as "*humane*". Yet, without proper care, live-captured wildlife in a cage trap can be treated inhumanely if not attended to appropriately. Therefore, the goal is to effectively address requests for assistance using methods in the most humane way possible that minimizes the stress and pain to the animal. Overall, the use of resource management methods, harassment methods, and exclusion devices are regarded as humane when used appropriately.

Although some issues of humaneness could occur from the use of cage traps, nets, repellents, immobilizing drugs, and reproductive inhibitors, those methods, when used appropriately and by trained personnel, would not result in the inhumane treatment of wildlife. Concerns from the use of those non-lethal methods are from injuries to animals while restrained and from the stress of the animal while being restrained or during the application of the method. Pain and physical restraint can cause stress in animals and the inability of animals to effectively deal with those stressors can lead to distress. Suffering occurs when action is not taken to alleviate conditions that cause pain or distress in animals. WS' personnel are present when waterfowl are live-captured which ensures action is taken immediately to alleviate the stress associated with waterfowl being restrained. The presence of WS' personnel on-site also ensures waterfowl live-captured are addressed immediately to minimize the stress associated with the handling of waterfowl and to prevent injury.

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

Alpha chloralose is used by WS as a sedative to live-capture geese and other waterfowl and does not cause euthanasia. When using alpha chloralose, WS' personnel would be present on site to retrieve birds that become sedated. Some concern occurs that waterfowl may drown if sedation occurs while they are loafing on water. WS would ensure that a boat and/or a canoe are available for quick retrieval of birds that become sedated while in the water.

Overall, the use of resource management methods, harassment methods, and exclusion devices are regarded as humane when used appropriately. Although some concern arises from the use of live-capture methods and immobilizing drugs, the stress of animals is likely temporary.

Under the proposed action, lethal methods could also be employed to resolve requests for assistance to resolve or prevent waterfowl damage and threats. Lethal methods would include shooting and euthanizing methods. The euthanasia methods being considered for use under the proposed action are cervical dislocation and carbon dioxide. The AVMA guideline on euthanasia lists cervical dislocation and carbon dioxide as acceptable methods of euthanasia for free-ranging birds which can lead to a humane death (AVMA 2007). The use of cervical dislocation or carbon dioxide for euthanasia would occur after the animal has been live-captured and away from public view. Although the AVMA guideline also lists gunshot as a conditionally acceptable method of euthanasia for free-ranging wildlife, there is greater potential the method may not consistently produce a humane death (AVMA 2007).

Some people have concerns over the potential for separation of goose family groups through management actions. This could occur through harassment (*e.g.*, pyrotechnics, dogs) and lethal control methods. However, it is not uncommon for family units to experience change. Bellrose (1980) cites several sources which list annual mortality rates of juvenile geese ranging from 7% to 19% during the hatching to fledgling stage. Biologists believe that juvenile birds have a good likelihood of survival without adult birds once the juvenile reaches fledgling stage, which occurs by July for most juvenile birds in Virginia. Therefore, molting juvenile geese that escape capture would most likely survive to adulthood (Mississippi Flyway Council Technical Section 1996). Separated adults form new pair bonds and readily breed with new mates (Moser et al. 1991).

Research and development by WS has improved the selectivity and humaneness of management techniques. Research is continuing to bring new findings and products into practical use. Until new findings and products are found practical, a certain amount of animal suffering could occur when some methods are used in situations where non-lethal damage management methods are not practical or effective. Personnel from WS are experienced and professional in their use of management methods. Consequently, management methods are implemented in the most humane manner possible under the constraints of current technology. The use of firearms to alleviate waterfowl damage and/or threats in the Commonwealth could be used under any of the alternatives by those experiencing damage regardless of WS' direct involvement. Therefore, the issue of humanness associated with shooting would be similar across any of the alternatives since firearms could be employed when permitted by the USFWS and the VDGIF to alleviate waterfowl damage and threats. Those persons who view a particular method as humane or inhumane would likely continue to view those methods as humane or inhumane under any of the alternatives. SOPs that would be incorporated into WS' activities to ensure methods are used by WS as humanely as possible are listed in Chapter 3.

Issue 5 - Effectiveness of Damage Management Methods

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

Alternative 1 - No Involvement by WS in Waterfowl Damage Management in the Commonwealth

The methods available to those experiencing damage under this alternative would be similar to those methods that would be available under the other alternatives. The only method that would not be available under this alternative would be the use of alpha chloralose which is restricted to use by WS only. WS would not be directly involved with application of any methods to resolve damage caused by

waterfowl in the Commonwealth under this alternative. The recommendation of methods and the use of methods would be the responsibility of other entities and/or those persons experiencing damage. When available methods are employed as intended, a reasonable amount of effectiveness is expected. If methods are employed incorrectly due to a lack of knowledge of the correct use of those methods or if methods are employed without consideration of the behavior of waterfowl causing damage, those methods being employed are likely to be less effective.

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

Alternative 2 - Addressing Waterfowl Damage by WS through Technical Assistance Only

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

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

The effectiveness of methods under this alternative would be similar to the other alternatives since many of the same methods would be available. If methods are employed as intended and with regard to the behavior of the waterfowl species causing damage, those methods are likely to be effective in resolving damage. The demonstration of methods and the information provided on waterfowl behavior provided by WS through technical assistance under this alternative would likely increase the effectiveness of the methods employed by those requesting assistance. However, if methods are employed that are not

recommended or if those methods are employed incorrectly by those requesting assistance, methods could be less effective in resolving damage or threats.

Alternative 3 - Continuing the Current Integrated Approach to Managing Waterfowl Damage (Proposed Action/No Action)

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

A common issue raised is that the use of lethal methods is ineffective because additional waterfowl are likely to return to the area, either after removal occurs or the following year when birds return to the area which gives the impression of creating a financial incentive to continue the use of only lethal methods. This assumes waterfowl only return to an area where damage was occurring if lethal methods are used. However, the use of non-lethal methods is also often temporary which could result in waterfowl returning to an area where damage was occurring once those methods are no longer used. The common factor when employing any method is that waterfowl would return if suitable habitat continues to exist at the location where damage was occurring and waterfowl densities are sufficient to occupy all available habitats. Therefore, any reduction or prevention of damage from the use of methods addressed in Appendix B would be temporary if habitat conditions continue to exist. In the case of Canada geese, WS primarily receives requests to reduce or prevent damage caused by geese considered resident in the Commonwealth. Therefore, any method that disperses or removes waterfowl from areas would only be temporary if habitat continues to exist the following year when waterfowl return to nest.

Dispersing waterfowl using pyrotechnics, repellents, border collies, or any other non-lethal method addressed in Appendix B often requires repeated application to discourage waterfowl which increases costs, moves waterfowl to other areas where they could cause damage, and are temporary if habitat conditions remain unchanged. Dispersing and the translocating of waterfowl could be viewed as moving a problem from one area to another which would require addressing damage caused by those waterfowl at another location. WS' recommendation of or use of techniques to modifying existing habitat or making areas unattractive to waterfowl is discussed in Appendix B. WS' objective is to respond to request for assistance with the most effective methods and to provide for the long-term solution to the problem using WS' Decision Model to adapt methods in an integrated approach to managing waterfowl damage that is agreed upon by the cooperator.

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

Managing damage caused by waterfowl can be divided into short-term redistribution approaches and long-term population and habitat management approaches (Cooper and Keefe 1997). Short-term

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

Redistribution methods are often employed to provide immediate resolution to damage occurring until long-term approaches can be implemented or have had time to reach the desired result. The USFWS has evaluated and implemented long-term approaches to managing resident Canada goose populations with the intent of reducing damage associated with resident Canada geese (USFWS 2005) and snow geese (USFWS 2007). Scaring waterfowl and physical barriers are often short-term solutions that move waterfowl to other areas where damages or threats could occur (Smith et al. 1999). Some short-term methods may become less effective in resolving damage as the waterfowl population increases and become more acclimated to human activity (Smith et al. 1999). Long-term solutions to resolving damage would require management of the population (Smith et al. 1999). Cooper and Keefe (1997) found that fencing and harassment with dogs are the only effective short-term approaches to reducing goose damage but likely redistribute the problem elsewhere. Hunting, goose removal, and egg destruction were identified as long-term solutions to resolving goose damage over larger geographical areas by reducing goose populations (Cooper and Keefe 1997). An integrated approach to resolving goose damage is likely the most effective (Smith et al. 1999).

Cooper (1991) reported the removal of geese posing or likely to pose a hazard to air safety at airports considerably reduced the population of local geese, decreased the number of goose flights through airport operations airspace, and significantly reduced goose-aircraft collisions at Minneapolis-St. Paul International Airport. In addition, Dolbeer et al. (1993) demonstrated that an integrated approach (including removal of offending birds) reduced bird hazards at airports and substantially reduced bird collisions with aircraft by as much as 89%. Jensen (1996) also reported that an integrated approach that incorporated the removal of geese, reduced goose-aircraft collisions by 80% during a two year period.

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

Chipman et al. (2008) found that crows could be dispersed from roost locations using non-lethal methods but crows would return to the original roost site within 2 to 8 weeks. The re-application of non-lethal methods to disperse crow roosts was required every year to disperse crows from the original roost or from roosts that had formed in other areas where damages were occurring (Chipman et al. 2008). Some short-term methods may become less effective in resolving damage as a bird population increases, as birds become more acclimated to human activity, and as birds become habituated to harassment techniques (Smith et al. 1999, Chipman et al. 2008). Non-lethal methods often require a constant presence at locations when waterfowl are present and must be repeated daily until the desired results are achieved which can increase the costs associated with those activities. During a six-year project using only non-lethal methods to disperse crows in New York, the number of events required to disperse crows remained similar amongst years and at some locations, the number of events required to harass crows increased from the start of the project (Chipman et al. 2008). 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).

Although crows are not specifically addressed in this EA, the discussion of those examples of management methods employed to address crow damage are likely representative of the results achieved by those methods when applied to any waterfowl species that exhibit similar behaviors such as those species addressed in this assessment.

As addressed previous, the methods available for resolving damage would be similar across all the alternatives analyzed. Under the proposed action, the use of alpha chloralose could occur by WS when deemed appropriate. Since all methods, except alpha chloralose, would be available under all the alternatives and when those methods are used as intended with consideration for the behavior of the target species, those methods would be considered effective.

Capture and euthanization of nuisance geese to reinforce hazing methods while conducting nest and egg destruction programs may be the most successful management strategy available. Recent research at an airport in the United Kingdom found that through the capture of approximately 287 geese each year over a period of three years, combined with the oiling of 2,980 eggs and hazing geese from problem roost sites, reduced goose movements over the airfield by 63% (Baxter and Robinson 2007).

WS typically institutes an integrated wildlife damage management program that utilizes a broad range of management tools. Lethal methods are used as a part of an integrated approach when non-lethal methods alone are ineffective. The proposed action has the greatest potential of successfully reducing waterfowl damage and allows those methods determined to be effective when using WS' Decision Model to be applied to resolve requests for assistance.

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

Issue 6 - Effects of Management Methods on Human Health and Safety

Concerns are often raised regarding the effects that methods can have on human safety, either from direct exposure of the public to the method or indirectly from the public encountering waterfowl that have been exposed to methods. The issue of human safety is discussed as it relates to each alternative in the following subsections.

Safety of Chemical Methods Employed

Alternative 1 - No Involvement by WS in Waterfowl Damage Management in the Commonwealth

Under the no waterfowl damage management alternative, WS would not be involved with any aspect of managing damage associated with waterfowl in the Commonwealth, including technical assistance. Due to the lack of involvement in managing damage caused by waterfowl, no impacts to human safety would occur directly from WS. This alternative would not prevent those entities experiencing threats or damage from waterfowl from conducting damage management activities in the absence of WS' assistance. The

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

Similar to Alternative 2, immobilizing drugs would not be available under this alternative to those experiencing damage or threats from geese and domestic waterfowl. If a reproductive inhibitor containing the active ingredient nicarbazin becomes registered for use in the Commonwealth, those persons with the appropriate applicators license and permission of the VDGIF could purchase and apply the chemical to reduce damage. Since most methods available to resolve or prevent waterfowl damage or threats are available to anyone, the threats to human safety from the use of those methods are similar between the alternatives. However, methods employed by those not experienced in the use of methods or are not trained in their proper use, could increase threats to human safety. Overall, the methods available to the public, when applied correctly and appropriately, pose minimal risks to human safety.

Alternative 2 - Addressing Waterfowl Damage by WS through Technical Assistance Only

Under this alternative, WS would be restricted to making recommendations on appropriate methods and the demonstration of methods to resolve damage. WS would only provide technical assistance to those requesting assistance with waterfowl damage and threats. Although hazards to human safety from non-lethal methods exist, those methods are generally regarded as safe when used by trained individuals who are experienced in their use.

The use of chemical methods would also be available under this alternative. Chemical methods available would include repellents and nicarbazin (if registered for use in the Commonwealth and approved by the VDGIF Director pursuant to Virginia law, § 29.1-508.1). Most repellents require ingestion of the chemical to achieve the desired affects on target species. Repellents that require ingestion are intended to discourage foraging on vulnerable resources and to disperse birds from areas where the repellents are applied. The active ingredients of repellents that are currently registered for use to disperse waterfowl include methyl anthranilate and anthraquinone. Methyl anthranilate (grape derivative) and anthraquinone (plant extract) are naturally occurring chemicals. Repellents, when used according to label directions, are generally regarded as safe especially when the ingredients are considered naturally occurring. Some risk of exposure to the chemical occurs to the applicator and to others from the potential for drift as the product is applied. Some repellents also have restrictions on whether application can occur on edible plants with some restricting harvest for a designated period after application. All restrictions on harvest and required personal protective equipment would be included on the label and if followed, would minimize risks to human safety associated with the use of those products.

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

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

the primary exposure occurring to those handling and applying the product. Safety procedures required by the label, when followed, would minimize risks to handlers and applicators.

Given the use profile of many chemical methods to manage damage and threats associated with waterfowl, the risks to human safety from the use of those methods are low when those methods are applied according to label requirements (USDA 1997). The cooperator requesting assistance is also made aware of threats to human safety associated with the use of those methods. SOPs for methods are discussed in Chapter 3 of this EA. Risks to human safety from activities and methods recommended under this alternative would be similar to the other alternatives since the same methods would be available, except for alpha chloralose. If misused or applied inappropriately, any of the methods available to alleviate waterfowl damage could threaten human safety. However, when used appropriately methods available to alleviate damage would not threaten human safety.

Alternative 3 - Continuing the Current Integrated Approach to Managing Waterfowl Damage (Proposed Action/No Action)

Chemical methods available under the proposed action would include repellents and immobilizing drugs. The immobilizing drug alpha chloralose would only be available for use by WS' employees. Repellents could be used by WS or recommended by WS under this alternative. Reproductive inhibitors may also be available under the proposed action and may be employed by or recommended for use by WS. Currently, the only reproductive inhibitor for waterfowl is a commercially available product with nicarbazin as the active ingredient. However, nicarbazin is not currently registered for use in Virginia. In addition, the Code of Virginia (§29.1-508.1) prohibits the use of chemicals that affect the structure or biological function of vertebrate wildlife species without a permit. Chemical methods available under the proposed action are further described in Appendix B.

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

The risks to human safety associated with repellents under the proposed action would be similar to those risks addressed in the no WS involvement alternative and the technical assistance only alternative. Repellents could be recommended to those requesting assistance or employed by WS as part of an integrated approach to managing waterfowl damage. When repellents are applied according to label instructions, no adverse affects to human safety should occur. If repellents are used by WS, the appropriate protective equipment would be used to ensure the safety of employees. Repellents are not likely to be used over large areas, where negative accumulations would threaten human safety, or where repeated use of repellents results in accumulation of chemicals at the application site. Repellents are registered and evaluated by the EPA which ensures the use of those products would not adversely affect the environment.

The reproductive inhibitor nicarbazin is currently not registered for Canada geese in Virginia. However, it is discussed in this assessment to evaluate the potential use of the chemical if a product becomes registered for use in Virginia. Based on the product-use profile and the potential reproductive hazards associated with non-targets, products containing nicarbazin as the active ingredient are classified as restricted-use pesticides by the EPA. Restricted-use pesticides can only be purchased and/or applied by those persons who have successfully completed an applicators course to use restricted-use pesticides. The VDACS administers training and testing required for applicators to purchase and apply restricted-use pesticides in the Commonwealth. Except for federal, Commonwealth, or local government employees in the performance of their official wildlife management duties, written authorization is required from VDGIF to administer drugs and/or chemical substances to wildlife (Code of Virginia, §29.1-508.1). Therefore, nicarbazin would not be available for public use without authorization from VDGIF. If a product containing nicarbazin as the active ingredient is registered in the Commonwealth for geese and/or waterfowl, WS may consider the use of the product and could employ the product as part an integrated approach under the proposed action.

Nicarbazin, as it is currently registered in other states, is commercially available as a restricted-use pesticide formulated on a bait product that can be delivered in bait pans or through broadcast applications. The product is registered for use only in urban areas in places where human activities are likely to occur. However, the label requires an acclimation process to condition birds to feed at a specific location at a specific time. All unconsumed bait must be retrieved. Therefore, the risks to human safety are minimal since unconsumed bait is retrieved and not left unattended for long periods of time. Since an acclimation period is required, birds can be conditioned to feed during periods of time when human activities in the area are minimal or can be conditioned to feed in locations away from human activity, which should minimize any exposure hazard that might occur from exposure to the bait. Bait would have to be handled to cause exposure. If nicarbazin becomes available in Virginia, the recommendation of the product and the potential use by WS would adhere to all label requirements of the product and permitting requirements of the VDGIF, which should assure that risks to human safety are minimal. Risks to human safety would be similar to those described under Alternative 2 since the use pattern of nicarbazin would be similar amongst the alternatives.

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

All WS' personnel who handle and administer immobilizing drugs, nicarbazin, and repellents would be properly trained. WS' employees handling and administering immobilizing drugs are required to be trained according to WS Directive 2.430. Training and adherence to agency directives would ensure the safety of employees administering any chemical methods. Waterfowl euthanized by WS after the use of immobilizing drugs would be disposed of by deep burial or incinerated to ensure the risks to human safety from euthanized waterfowl are minimal (see WS Directive 2.515). All euthanasia would occur in the absence of the public to further minimize risks. SOPs which further reduce risks to human safety are further described in Chapter 3 of this EA.

No adverse affects to human safety have occurred from WS' use of chemical methods to alleviate waterfowl damage in Virginia from FY 2004 through FY 2009. The risks to human safety from the use of chemical methods, when used appropriately and by trained personnel, is considered low. Based on a thorough Risk Assessment, APHIS concluded that when chemicals are used according to label directions, they are selective to target individuals or populations, and such use has negligible impacts on the environment (USDA 1997).

Safety of Non-Chemical Methods Employed

Alternative 1 - No Involvement by WS in Waterfowl Damage Management in the Commonwealth

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

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

Alternative 2 - Addressing Waterfowl Damage by WS through Technical Assistance Only

Under the technical assistance alternative, WS would only recommend the use of available non-chemical methods for managing damage caused by waterfowl. Recommendations would be made based on the appropriate decision-making process and on information provided by the requester or from a site visit. The implementation of non-chemical methods would be the sole responsibility of the requester. WS would not be directly involved with managing damage caused by waterfowl in the Commonwealth. Non-chemical methods available for use under the technical assistance only alternative are addressed in Appendix B.

Since those non-chemical methods discussed in Appendix B would be similar across the alternatives, the risks to human safety under a technical assistance alternative would be similar to those discussed in the no involvement by WS alternative (Alternative 1) if methods are applied appropriately and in consideration of human safety.

Risks to human safety from the use of non-lethal methods were considered low when evaluated in a formal risk assessment conducted as part of the development of WS' programmatic FEIS (USDA 1997). Risks to human safety associated with non-chemical methods such as resource management methods (*e.g.*, crop selection, limited habitat modification, modification of human behavior), exclusion devices, frightening devices, and live-capture methods were considered low based on their use profile for alleviating damage associated with wildlife (USDA 1997). Although some risk of fire and bodily harm exists from the use of pyrotechnics and propane cannons, when used appropriately and in consideration of those risks, they can be used with a high degree of safety.

Under a technical assistance only alternative, the use of nets (*e.g.*, rocket nets, cannon nets) would not be available to the general public but could be employed by other federal and state agencies. Personnel employing nets are present at the site during application to ensure the safety of the public and operators. Although some fire and explosive hazards exist with rocket nets during ignition and storage of the explosive charges, safety precautions associated with the use of the method, when adhered to, pose minimal risks to human safety and primarily occur to the handler. Nets would not be employed in areas where public activity is high which further reduces the risks to the general public. Nets would be employed in areas where public access is restricted whenever possible to reduce risks to human safety. Overall, nets would pose minimal risks to the public.

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

The recommendation of shooting with firearms as a method of direct lethal take could occur under this alternative. Safety issues due arise related to misusing firearms and the potential human hazards associated with firearms use when employed to reduce damage and threats. When used appropriately and with consideration for human safety, risks associated with firearms are minimal. If firearms are employed inappropriately or without regard to human safety, serious injuries could occur. Under this alternative, recommendations of the use of firearms by WS would include human safety considerations. Since the use of firearms to alleviate waterfowl damage would be available under any of the alternatives and the use of firearms by those persons experiencing waterfowl damage could occur whether WS was consulted or contacted, the risks to human safety from the use of firearms would be similar among all the alternatives.

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

Given the use profile of many methods to manage damage and threats associated with waterfowl, the risks to human safety from the use of those methods are low (USDA 1997). The cooperator requesting assistance is also made aware of threats to human safety associated with the use of those methods. Minimization measures for methods would be recommended during technical assistance projects. Risks to human safety from activities and methods recommended under this alternative would be similar to the other alternatives since the same methods would be available. If misused or applied inappropriately, any of the non-chemical methods available to alleviate waterfowl damage could threaten human safety. However, when used appropriately methods available to alleviate damage would not threaten human safety.

Alternative 3 - Continuing the Current Integrated Approach to Managing Waterfowl Damage (Proposed Action/No Action)

The non-chemical methods available under an integrated approach would be the same as those methods available under all the alternatives as permitted by the USFWS and/or the VDGIF. When requested under this alternative, WS would directly employ methods to alleviate or prevent waterfowl damage from occurring in the Commonwealth. WS would also recommend non-chemical methods as part of a technical assistance program in an integrated approach to managing waterfowl damage. WS' required training and directives ensure that those persons employing methods are properly trained and knowledgeable in the use of those methods. WS' would use the Decision Model to determine the appropriate method or methods that would effectively resolve the request for assistance. Those methods would be continually evaluated for effectiveness and if necessary, additional methods could be employed. Non-lethal and lethal methods could be used under the proposed action. WS would continue to provide technical assistance and/or direct operational assistance to those persons seeking assistance with managing damage or threats from waterfowl. Risks to human safety from technical assistance conducted by WS would be similar to those risks addressed under the other alternatives. The use of non-lethal methods as part of an integrated approach to managing damage that would be employed as part of direct operational assistance by WS would be similar to those risks addressed in the other alternatives.

Non-chemical methods available for use under this alternative are those discussed in Appendix B. As described previously, non-chemical methods do not result in direct take of waterfowl, except for firearms and nest destruction. Most non-chemical methods involve the harassment or live-capturing of target waterfowl. Though some risks from harassment methods may occur, those risks are minimal when those methods are used appropriately and as intended. Firearms and cannon/rocket nets may also pose a risk to human safety when not handled or applied appropriately. All methods would be employed in areas where human activities would be minimal, when possible. WS would continue to employ methods according to all SOPs described in Chapter 3.

One measure which further reduces the risks to human safety when WS is directly involved with applying those methods is the knowledge and training received by WS' personnel. WS' employees who would conduct waterfowl damage management activities are knowledgeable in the use of methods, wildlife species responsible for causing damage or threats, and WS' directives. That knowledge is incorporated into the decision-making process inherent with the WS' Decision Model that is applied when addressing threats and damage caused by waterfowl. When employing lethal methods, WS' employees would consider risks to human safety when employing those methods based on location and method. Risks to human safety from the use of methods is likely greater in urban areas when compared to rural areas that are less densely populated. Consideration is also given to the location where damage management activities would be conducted based on property ownership. If locations where methods would be employed occur on private property in rural areas where access to the property is controlled and monitored, the risks to human safety from the use of methods is likely less. If damage management

activities occur at parks or near other public use areas, then risks of the public encountering damage management methods and the corresponding risk to human safety increases.

Safety issues may arise from the misuse of firearms and the potential human hazards associated with firearms use when employed to reduce damage and threats. To help ensure safe use and awareness, WS' employees who use firearms to conduct official duties are required to attend an approved firearms safety training course. The use of firearms by WS' employees would occur pursuant to WS Directive 2.615. As a condition of employment, WS' employees who carry and use firearms are subject to the Lautenberg Domestic Confiscation Law, which prohibits firearm possession by anyone who has been convicted of a misdemeanor crime of domestic violence (18 USC § 922(g)(9)). A safety assessment based on site evaluations, coordination with cooperating and local agencies (if applicable), and consultation with cooperators would be conducted before firearms are deemed appropriate to alleviate or reduce damage and threats to human safety when conducting activities in the Commonwealth. WS and cooperating agencies would work closely with cooperators requesting assistance to ensure all safety issues are considered before firearms are deemed appropriate for use. After evaluation of the damage or threat of damage associated with the request for assistance using the WS' Decision Model, the WS employee would determine which methods were appropriate for reducing damage or threats of damage at that particular location based on information provided and requested from the requesting entity. Those methods determined to be appropriate to resolve the request for assistance would be agreed upon with the cooperator to ensure the safe use of those methods prior to the application of those methods. Only those methods agreed upon through a MOU, cooperative service agreement, or other comparable agreement would be employed to resolve a particular request for assistance. A risk assessment conducted during the development of WS' programmatic FEIS, determined the risks to human safety from the use of firearms was low based on the use profile of the method (USDA 1997).

The use of restraining devices has also been identified as a potential issue. Restraining devices include live-traps and nets. Those devices pose minimal risks to the public or domestic pets when used appropriately. Restraining devices are typically set in areas where human activity is minimal to ensure public safety. Restraining devices rarely cause serious injury and are triggered through direct activation of the device. Therefore, human safety concerns associated with restraining devices used to capture wildlife, including waterfowl, require direct contact to cause bodily harm. Again, restraining devices are not located in high-use areas to ensure the safety of the public and pets. An APHIS risk assessment in WS' programmatic FEIS concluded that threats to human safety from the use of devices to restrain wildlife were low (USDA 1997).

Effects of not Employing Methods to Reduce Threats to Human Safety

Alternative 1 - No Involvement by WS in Waterfowl Damage Management in the Commonwealth

Threats to human safety often occur due to interactions between people and waterfowl where a concern arises from transmission of zoonotic diseases, from physical interactions that result in injuries, from unsafe work conditions, and/or from threats of aircraft striking waterfowl. In the absence of an effective program to address human safety associated with waterfowl, the risks associated with potential disease transmission and injuries would also likely increase. Risks to human safety associated with waterfowl were discussed in Chapter 1 of this EA.

Under this alternative, no assistance would be provided to those experiencing damage or threats associated with waterfowl in the Commonwealth. In the absence of any assistance, those experiencing threats to human safety would be directly responsible for obtaining and employing the appropriate methods. Those persons employing methods could be at a higher risk of exposure to zoonotic diseases and injury since no guidance or recommendations would be made by WS. Dolbeer and Suebert (2007)

reported that despite the continued high population of resident Canada geese in the United States, aircraft strikes with geese declined from 115 in 1998 to 67 in 2007, likely due to aggressive Canada goose management programs implemented at airports and in urban areas. WS provides assistance to many civilian and military airports in the Commonwealth to manage threats to aviation safety from waterfowl. Under this alternative, WS would provide no assistance in reducing threats to aviation safety from waterfowl, requiring those experiencing threats to aircraft safety to be responsible for obtaining and employing the appropriate methods to reduce those threats. Risks to human safety under this alternative would be greater than those risks in the other alternatives.

Alternative 2 - Addressing Waterfowl Damage by WS through Technical Assistance Only

Under this alternative, WS would provide assistance to requestors by providing information regarding waterfowl, on the availability of methods, and the proper use of methods available to the requestor. Methods recommended would be based on WS' decision-making process either through information gathered during a site visit or from information provided by telephone.

Threats to human safety under the technical assistance alternative could be resolved by those persons implementing methods recommended by WS. The effectiveness in reducing threats would be based on the knowledge of the person to effectively implement the methods and knowledge of the behavior of the target species that would increase the likelihood of resolving the threat. The ability to resolve threats to human safety by those requesting technical assistance would also be dependant upon the availability of methods and the effectiveness of those methods, and the ability of the requestor to acquire those methods.

Given the expertise of WS in the behavior of the target species and the knowledge in the effective use of available methods, the potential threats to human safety under this alternative is likely lower than Alternative 1 for those requesting assistance from WS but likely similar to higher compared to the proposed action alternative. Under this alternative, those requesting assistance would be responsible for implementing and using methods to resolve damage or threats of damage which places the requestor at a higher risk of exposure to disease and injury if not trained appropriately. The degree in which the risk is higher is unknown and is likely highly variable.

Alternative 3 - Continuing the Current Integrated Approach to Managing Waterfowl Damage (Proposed Action/No Action)

Under the adaptive damage management alternative, methods deemed appropriate to resolve threats to human safety associated with waterfowl would be employed by WS. Threats to human safety may not be completely eliminated under this alternative. However, under this alternative, a higher level of assistance would be provided since WS could employ methods to address requests to reduce threats to human safety. Though measuring the reduction in threats to human safety by implementing the proposed action are difficult, it is reasonable to predict that using the adaptive damage management program using integrated methodologies would lower the degree of risks of threats to human safety given that the expertise of WS in managing damage and threats would likely result in a reduction in the time necessary to resolve the threat. Reducing the time necessary to resolve the threat decreases the potential exposure time of the threat to the public which results in a reduction in the risks of interaction resulting in a human safety threat. Therefore, the duration of exposure would likely be shortened under this alternative by the use of integrated methods which would result in a reduction in the threat to human safety.

This alternative would allow personnel from WS that are trained in the use of appropriate methodologies for addressing threats and are trained in the appropriate handling of methods to ensure the safety of the handler and the public to address threats to human safety associated with waterfowl. The other alternatives would place the immediate burden of resolving threats to human safety on those requesting

assistance which are not likely to be trained in the proper use of methods which would increase the threat of injury or disease transmission to the handler and to the public.

Issue 7 - Effects on the Regulated Harvest of Waterfowl

Another common concern is the potential effects of damage management activities on the ability to harvest target species during the regulated hunting season in the Commonwealth. Methods are intended to disperse or remove target species from an area where damage is occurring which could reduce the opportunities to harvest those waterfowl during the regulated harvest season. Most waterfowl species addressed in this assessment have established annual hunting seasons in the Commonwealth. The only species addressed in this assessment that do not have established hunting season include mute swans, feral domestic waterfowl, Muscovy ducks, and pied-billed grebes. Mute swans and feral domestic waterfowl are non-native species within the Commonwealth and can be taken at any time to alleviate damage using legal methods. Muscovy ducks can be taken under the established depredation order without the need for a depredation permit from the USFWS. Pied-billed grebes can only be taken through the issuance of a depredation permit by the USFWS. The take of those species addressed in this assessment by WS would only occur under depredation permits issued by the USFWS except for mute swans, feral domestic waterfowl, and Muscovy ducks with can be lethally taken without the need for a depredation permit, including take that could occur by WS.

Alternative 1 - No Involvement by WS in Waterfowl Damage Management in the Commonwealth

WS would have no impact on regulated waterfowl hunting under this alternative. WS would not be involved with any aspect of waterfowl damage management in the Commonwealth. The USFWS and the VDGIF would continue to regulate waterfowl populations through adjustments in allowed take during the regulated harvest season and through depredation permits.

Alternative 2 - Addressing Waterfowl Damage by WS through Technical Assistance Only

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

Take of feral waterfowl, mute swans, and Muscovy ducks could continue to occur without a permit from the USFWS and VDGIF under this alternative. The take of feral waterfowl, mute swans, and Muscovy ducks under any of the alternatives is likely to be similar since take could occur at any time and is not dependent on WS' direct or indirect involvement.

Alternative 3 - Continuing the Current Integrated Approach to Managing Waterfowl Damage (Proposed Action/No Action)

WS' waterfowl damage management activities would primarily be conducted on populations in areas where hunting access is restricted (*e.g.*, airports) or has been ineffective (*e.g.*, urban areas). The use of non-lethal or lethal methods often disperses waterfowl from areas where damage is occurring to areas outside the damage area which could serve to move waterfowl from those less accessible areas to places accessible to hunters.

The magnitude of take of waterfowl addressed in the proposed action would be low when compared to the waterfowl mortality from all known sources. When WS' proposed take of waterfowl was included as part of the known mortality of waterfowl in 2004 through 2009 and compared to the estimated waterfowl population, the impact on the waterfowl population was consistent with management goals set by the USFWS and VDGIF. The USFWS and the VDGIF would determine the number of waterfowl taken annually by WS through the issuance of depredation permits.

Waterfowl damage management activities conducted by WS would occur after consultation and approval by the USFWS and the VDGIF. With oversight by the USFWS and the VDGIF, the number of waterfowl allowed to be taken by WS would not limit the ability of those interested to harvest waterfowl during the regulated season. All take by WS would be reported to the USFWS annually to ensure take by WS is incorporated into population management objectives established for waterfowl populations. Based on the limited take proposed by WS and the oversight of by the USFWS and the VDGIF, WS' take of waterfowl annually under the proposed action would have no effect on the ability of those interested to harvest waterfowl during the regulated harvest season.

4.2 CUMULATIVE IMPACTS OF THE PROPOSED ACTION BY ISSUE

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

Under Alternative 2 and Alternative 3, WS would address damage associated with waterfowl either by providing technical assistance (Alternative 2) or by providing technical assistance and direct operational assistance (Alternative 3) in the Commonwealth. WS would be the primary agency conducting direct operational waterfowl damage management in the Commonwealth under Alternative 2 and Alternative 3. However, other federal, Commonwealth, and private entities could also be conducting waterfowl damage management in the Commonwealth. The take of waterfowl species requires a depredation permit from the USFWS pursuant to the MBTA, which requires permit holders to report all take occurring under the permit. Take of Canada geese could also occur under guidelines evaluated in the USFWS resident Canada goose management FEIS (USFWS 2005). Muscovy ducks can also be lethally taken under a depredation order without the need for a depredation permit. As was mentioned previously, only the take of mute swans and feral domestic waterfowl can occur without the need for a depredation permit.

WS does not normally conduct direct damage management activities concurrently with such agencies or other entities in the same area, but may conduct waterfowl damage management activities at adjacent sites within the same time frame. In addition, commercial pest control companies may conduct waterfowl damage management activities in the same area when permitted by the USFWS and/or the VDGIF for those species where a depredation permit is required. The potential cumulative impacts analyzed below could occur either as a result of WS' damage management program activities over time, or as a result of the aggregate effects of those activities combined with the activities of other agencies and private entities.

Through ongoing coordination and collaboration between WS, the USFWS, and the VDGIF, activities of each agency and the take of those waterfowl requiring a depredation permit would be available. Waterfowl damage management activities in the Commonwealth would be monitored annually to evaluate and analyze activities to ensure they are within the scope of analysis of this EA.

Issue 1 - Effects on Target Waterfowl Populations

Evaluation of activities relative to target species indicated that program activities would likely have no cumulative adverse affects on waterfowl populations in the Commonwealth when targeting those species responsible for the damage. WS' actions would be occurring simultaneously, over time, with other natural processes and human generated changes currently taking place. Those activities include, but are not limited to:

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

All of those factors play a role in the dynamics of waterfowl populations. In many circumstances, requests for assistance arise when some or all of those elements have contrived to elevate target species populations or place target species at a juncture to cause damage to resources. The actions taken to minimize or eliminate damage are constrained as to scope, duration, and intensity for the purpose of minimizing or avoiding impacts to the environment. WS and cooperating agencies evaluate damage occurring, including other affected elements and the dynamics of the damaging species; determine appropriate strategies to minimize effects on environmental elements; apply damage management actions; and subsequently monitor and adjust/cease damage management actions (Slate et al. 1992, USDA 1997, USDA 1999). This process allows WS and cooperating agencies to take into consideration other influences in the environment, such as those listed above, in order to avoid cumulative adverse impacts on target species.

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

WS' take of waterfowl in the Commonwealth from FY 2004 through FY 2009 was of a low magnitude when compared to the total known take. WS' annual take of waterfowl in the Commonwealth would occur under depredation permits issued by the USFWS for those species where a permit is required for take. The USFWS and the VDGIF considers all known take when determining population objectives for waterfowl in the Commonwealth and adjusts the number of waterfowl that could be taken during the regulated hunting season and the number of waterfowl taken for damage management purposes to achieve the population objectives. Any take by WS would occur at the discretion of the USFWS and the VDGIF and any waterfowl population declines or increases would be the collective objective for waterfowl populations established by the USFWS and the VDGIF. Therefore, the cumulative take of waterfowl annually or over time by WS would occur at the desire of the USFWS and the VDGIF as part of management objectives for waterfowl in the Commonwealth.

No cumulative adverse impacts on target wildlife are expected from WS' waterfowl damage management actions based on the following considerations:

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

Waterfowl damage management activities are conducted by WS only at the request of a cooperator to reduce damage that is occurring or to prevent damage from occurring and only after methods to be used are agreed upon by all parties involved. Only those waterfowl identified as causing damage or posing a threat of damage are targeted by WS. WS annually monitors activities to ensure any potential impacts are identified and addressed. WS works closely with State and federal resource agencies to ensure damage management activities are not adversely impacting waterfowl populations and that WS' activities are considered as part of management goals established by those agencies. Historically, WS' activities to manage damage caused by waterfowl in Virginia have not reached a magnitude that would cause adverse impacts to waterfowl populations in the Commonwealth based on the population data and harvest data.

2. SOPs built into the WS program

SOPs are designed to reduce the potential negative effects of WS' actions on waterfowl, and are tailored to respond to changes in wildlife populations which could result from unforeseen environmental changes. This would include those changes occurring from sources other than WS. Alterations in programs are defined through SOPs and implementation is insured through monitoring, in accordance with the WS' Decision Model (Slate et al. 1992, USDA 1997).

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

Potential effects on non-target species from conducting waterfowl damage management arise from the use of non-lethal and lethal methods to alleviate or prevent those damages. The use of both non-lethal and lethal methods during activities to reduce or prevent damage caused by waterfowl has the potential to exclude, disperse, capture, or take non-target wildlife. Non-lethal methods can also exclude, disperse, and/or harass non-target wildlife as a secondary event during the primary use of those methods on target wildlife. However, non-lethal methods are often temporary and do not involve the take of non-target wildlife species. When using exclusion devices, both target and non-target wildlife can be prevented from accessing the resource which may have differing values depending on the species of wildlife. Since exclusion does not involve lethal take, impacts from the use of exclusionary methods would not cumulatively impact non-target species. 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 resources 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 often returning after the cessation of those activities. Dispersal and harassment does not involve the take of non-target species and similar to exclusionary methods are not used to the extent or constant level that would prevent non-targets from accessing critical resources that would threaten survival of a population.

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

The use of lethal methods or those methods used to live-capture target species followed by euthanasia also has the potential to impact non-target wildlife through the take or capture of non-target species. Capture methods used are often methods that are set to confine target wildlife after being triggered. Capture methods are employed in such a manner as to minimize the threat to non-target species by placement in those areas frequently used by target wildlife, using baits or lures that are as species specific as possible, and modification of individual methods to exclude non-targets from capture. Most methods described in Appendix B are methods that are employed to confine wildlife that are subsequently euthanized using humane methods. WS' 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, immobilizing chemicals, reproductive inhibitors, and euthanasia methods are essentially selective for target species since identification of an individual is made prior to the application of the method. Immobilizing chemicals and reproductive inhibitors are applied using hand baiting which targets individuals or groups of target species in which the birds have been acclimated to feeding on the bait in a certain location. With immobilizing drugs and reproductive inhibitors, all unconsumed bait must be retrieved after each application which further limits non-target exposure. With immobilizing chemicals, the applicator is present on-site at all times to retrieve sedated birds which allows for constant monitoring for non-targets in the area of application. Firearms require the identification of the target before application which essentially is selective with minimal risks to non-targets. Euthanasia methods require the target bird species to be restrained before application which allows for any non-targets to be released if captured. Therefore, the use of those methods would not impact non-target species.

The methods described in Appendix B all have a high level of selectivity and can be employed using SOPs to ensure impacts to non-targets are minimal. No non-targets have been taken by WS during waterfowl damage management activities from FY 2004 through FY 2009. Based on the methods available to resolve waterfowl damage and/or threats, WS does not anticipate the number of non-targets taken (killed) 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, including T&E species. WS has reviewed the T&E species listed in the Commonwealth by the VDGIF, the USFWS, and the National Marine Fisheries Service. The USFWS and VDGIF have concurred with WS' determination that waterfowl damage management activities are not likely to adversely affect T&E species in the Commonwealth (C. Schulz, USFWS, letter to J. Cromwell, WS, August 10, 2010; R. Fernald, VDGIF, letter to J. Cromwell, WS, June 17, 2010).

Waterfowl damage management methods used or recommended by the WS program in the Commonwealth of Virginia would have no cumulative adverse effects on target and non-target wildlife populations. When methods and techniques are implemented by WS, the potential lethal take of non-target wildlife species is expected to be minimal to non-existent.

Issue 3 - Effects on the Aesthetic Values of Target Waterfowl

The activities of WS and the USFWS permitted take would result in the removal of waterfowl from those areas where damage or threats were occurring. Therefore, the aesthetic value of those waterfowl species removed in those areas where damage management activities were being conducted would be reduced. Mute swans and feral waterfowl are non-native species in the Commonwealth which can negatively impact the natural environment. For some people, the aesthetic value of a more natural environment would be gained by the removal of non-native species, including the return of native wildlife and plant species that may be suppressed or displaced by the presence of those non-native species.

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, especially when those species are non-native to the natural environment. Continued increases in numbers of individuals or the continued presence of a non-native species may lead to further degradation of some people's enjoyment of any wildlife or the natural environment. The actions of WS could positively affect the aesthetic enjoyment of wildlife for those people that are being adversely affected by the target species identified in this EA. Executive Order 13112 directs federal agencies whose actions may affect the status of invasive species to reduce invasion of those species and the associated damages to the extent practicable and permitted by law.

Waterfowl population objectives are established and enforced by the USFWS and the VDGIF through regulating the take of waterfowl 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 waterfowl population since all take by WS occurs at the discretion of the USFWS and the VDGIF. Since those persons seeking assistance could remove waterfowl from areas where damage is occurring through depredation permits issued by the USFWS and the VDGIF, during regulated hunting season, or under depredation orders, WS' involvement would have no effect on the aesthetic value of waterfowl in the area where damage was occurring. When a depredation permit has been issued by the USFWS and the VDGIF to a property owner and/or manager that is experiencing damage caused by waterfowl, the removal of waterfowl under that permit would likely occur whether WS was involved with taking the waterfowl or not.

Therefore, the activities of WS are not expected to have any cumulative adverse affects 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 VDGIF who are responsible for regulating a resident wildlife species, like waterfowl.

Issue 4 - Humaneness and Animal Welfare Concerns of Methods

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

As discussed previously, the perception of humaneness and welfare varies among people. Generally, non-lethal methods involving habitat modification, harassment, and dispersal are considered humane methods since wildlife are displaced to other areas and are generally unharmed. Restraining methods that result in live-capture are often viewed as inhumane when wildlife are held for long periods of time, which can often lead to pain, stress, and ultimately, distress of the animal. Restraining devices used for the capture of waterfowl (*e.g.*, corral traps, cannon nets) all require supervision of the methods during application which allows for those waterfowl captured to be addressed in a timely manner which reduces the amount of time those individuals are held. By limiting the amount of time wildlife are held in restraining devices and by promptly addressing those captured, pain, suffering, and distress can be minimized.

Immobilizing drugs are used to sedate and anesthetize target waterfowl through hand-baiting for specific individuals or groups. Applicators are present on site during application to retrieve sedated waterfowl which ensures those birds to be captured using alpha chloralose are addressed in a timely manner. The effects of alpha chloralose are temporary with a full recovery occurring if the drug is allowed to be fully metabolized. Since waterfowl sedated with alpha chloralose recover, birds can be translocated with minimal pain and released unharmed after recovery, if desired. If euthanasia occurs, birds captured using

alpha chloralose are euthanized while anesthetized which renders the bird unconscious and unresponsive, allowing for birds to be euthanized with no pain or suffering.

Humaneness and animal welfare concerns can also arise from the use of euthanasia methods. The guidelines for euthanasia of free-ranging birds provided by the AVMA lists carbon dioxide, cervical dislocation, and gunshot as acceptable methods of euthanasia (AVMA 2007). Shooting would occur in limited situations and personnel would be trained in the proper use of firearms to minimize pain and suffering of waterfowl 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 waterfowl, the cumulative impacts on the issue of method humaneness are minimal. All methods would be evaluated annually to ensure measures and SOPs are adequate to ensure those methods continue to be used to minimize suffering and that wildlife captured are addressed in a timely manner to minimize distress.

Issue 5 - Effectiveness of Damage Management Methods

As discussed in Chapter 2, the effectiveness of any damage management program could be defined in terms of losses or risks potentially reduced or prevented which is based on how accurately practitioner's 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 or threats is 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 the EA in Chapter 1.

As part of an integrated approach to managing waterfowl damage, WS has the ability to adapt methods to damage situations to effectively reduce or prevent damage from occurring. Under the proposed integrated approach, all methods, individually or in combination, could be employed as deemed appropriate through

WS' Decision Model to address requests for assistance. WS' objective when receiving a request for assistance under the proposed action is to reduce damage and threats to human safety or to prevent damage from occurring using an integrated approach to managing waterfowl damage. Therefore, under the proposed action, WS would employ methods adaptively to achieve that objective.

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

CEQ does not require a formal, monetized cost-benefit analysis to comply with the NEPA (40 CFR 1508.14) and consideration of this issue is not essential to making a reasoned choice among the alternatives being considered. WS' programmatic FEIS (USDA 1997) states:

"Cost effectiveness is not, nor should it be, the primary goal of the APHIS WS program. Additional constraints, such as the environmental protection, land management goals, and others, are considered whenever a request for assistance is received. These constraints increase the cost of the program while not necessarily increasing its effectiveness, yet they are a vital part of the APHIS WS Program."

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

Concern is often raised that waterfowl only return to an area where damage was occurring if lethal methods are used which creates a financial incentive to continue the use of only lethal methods. However, as stated throughout the EA, the use of non-lethal methods are also often temporary which could result in waterfowl returning to an area where damage was occurring once those methods are no longer used. Waterfowl would return if suitable habitat continues to exist at the location where damage was occurring and waterfowl 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 waterfowl from areas would only be temporary if habitat continues to exist the following year when waterfowl return to nest. Dispersing waterfowl using pyrotechnics, repellents, border collies, or any other non-lethal method addressed in the EA often requires repeated application to discourage waterfowl which increases costs, moves waterfowl to other areas where they could cause damage, and are temporary if habitat conditions remain unchanged. Dispersing waterfowl could be viewed as moving problem waterfowl from one area to another which would require addressing damage caused by those waterfowl at another location. WS' recommendation of or use of techniques to modifying existing habitat or making areas unattractive to waterfowl was addressed in the EA and in Appendix B. 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 waterfowl damage that is agreed upon by the cooperator. WS' legislative authority to manage wildlife damage was also addressed in this EA.

Issue 6 - Effects of Management Methods on Human Health and Safety

Non-Chemical Methods

All non-chemical methods described in Appendix B are used within a limited time frame, are not residual, and do not possess properties capable of inducing cumulative adverse impacts on human health and safety. All non-chemical methods are used after careful consideration of the safety of those employing methods and to the public. All capture methods are employed in areas where human activity is minimal to ensure the safety of the public. Capture methods also require direct contact to trigger ensuring that those methods, when left undisturbed would have no effect on human safety. All methods are agreed upon by the requesting entities which are made aware of the safety issues of those methods when entering into a MOU, cooperative service agreement, or other comparable document with WS. SOPs also ensure the safety of the public from those methods used to capture or take wildlife. A formal risk assessment conducted by APHIS determined that WS' non-chemical methods, when used as intended, poses a low risk to human safety (USDA 1997). Firearms used to alleviate or prevent damage, though hazards do exist, are employed to ensure the safety of employees and the public. Based on the use of non-chemical methods, those methods would not cumulatively impact human safety.

Chemical Methods

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

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

The immobilizing drug alpha chloralose is only available to WS for use to capture waterfowl. To capture waterfowl, alpha chloralose tablets are inserted into a dough ball made out of bread and/or the powder form is formulated onto whole kernel corn or mixed and used with bread baits. After an acclimation period where waterfowl are habituated to feeding on certain bait, being fed at a certain time, and at a certain location, treated baits are substituted for the pre-bait. As required by WS' use of alpha chloralose under the INAD, all unconsumed bait must be retrieved. Since target wildlife are habituated to feed at a

certain location and a certain time on a similar pre-bait, a general estimate of the needed bait can be determined and bait is readily consumed by target species which limits the amount of time bait is exposed. Application of alpha chloralose is limited in duration given that baiting ceases once the target birds are removed. Through acclimation, the majority of target birds can be conditioned to feed at a certain time and location which allows for the majority of target birds to be removed after an initial application of alpha chloralose treated baits. Some follow-up baiting could occur to remove any remaining waterfowl that were not captured during the initial baiting efforts. In compliance with FDA use restrictions, the use of alpha chloralose is prohibited for 30 days prior to and during the hunting season on waterfowl and other game birds that could be hunted. Given the use patterns of alpha chloralose described, no cumulative impacts from the use of alpha chloralose to capture waterfowl are expected.

WS' personnel are required to attend training courses and be certified in the application of alpha chloralose to ensure proper care and handling, to ensure the proper doses are administered, and to ensure human safety.

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

The only euthanasia chemical proposed for use by WS is carbon dioxide, which is an approved method of euthanasia for birds by the AVMA. Carbon dioxide is naturally occurring in the environment ranking as the fourth most abundant gas in the atmosphere. However, in high concentrations carbon dioxide causes hypoxia due to the depression of vital centers and is considered a moderately rapid form of euthanasia (AVMA 2007). Carbon dioxide is commercially available as a compressed bottled gas. Carbon dioxide is a colorless, odorless, non-flammable gas used for a variety of purposes, such as in carbonated beverages, dry ice, and fire extinguishers. Although some hazards exist from the inhalation of high concentrations of carbon dioxide during application for euthanasia purposes, when use appropriately, the risks of exposure are minimal. Since carbon dioxide is a common gas found in the environment, the use of and/or recommending the use of carbon dioxide for euthanasia purposes with not have cumulative impacts.

Issue 7 - Effects on the Regulated Harvest of Waterfowl

As discussed previously in this EA, the magnitude of WS' waterfowl take for damage management purposes from FY 2004 through FY 2009 was low when compared to the total take of waterfowl and when compared to the estimated statewide population. Since all take of waterfowl is regulated by the USFWS and the VDGIF, the take of waterfowl by WS that would occur annually and cumulatively would occur pursuant to waterfowl population objectives established in the USFWS and the VDGIF. WS' proposed take of waterfowl to alleviate damage would be a minor component to the known take that occurs annually. With oversight of waterfowl take, the USFWS and the VDGIF maintains the ability to regulate take by WS to meet management objectives for waterfowl in the Commonwealth. Therefore, the cumulative take of waterfowl is considered as part of the USFWS and VDGIF objectives for waterfowl populations in the Commonwealth.

4.3 ADDITIONAL ANALYSES OF POTENTIAL CUMULATIVE IMPACTS

Irreversible and Irretrievable Commitments of Resources

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

Effects on Sites or Resources Protected under the National Historic Preservation Act

Actions of WS and cooperating agencies are not undertakings that could adversely affect historic resources.

4.4 SUMMARY OF THE CUMULATIVE IMPACTS ANALYSIS

No significant cumulative environmental impacts are expected from any of the three alternatives, including the proposed action. Under the proposed action, the management of damage associated with waterfowl in the Commonwealth by integrating methods and techniques by WS would not have significant impacts on the populations of any of the waterfowl species addressed in this assessment. No risk to public safety is expected when activities are provided and accepted by requesting individuals in the technical assistance only alternative and the proposed action since only trained and experienced personnel would conduct and recommend damage management activities. There is a slight increased risk to public safety when persons who reject assistance and recommendations in Alternative 1 and Alternative 2 and conduct their own activities. In all Alternatives, however, it would not be to the point that the impacts would be significant. Although some persons would likely be opposed to waterfowl damage management activities in the Commonwealth, the analysis in this EA indicates that an integrated approach to the management of damage and threats caused by waterfowl would not result in significant cumulative adverse impacts on the quality of the human environment.

CHAPTER 5: LIST OF PREPARERS, REVIEWERS, AND PERSONS CONSULTED

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Appendix A

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Appendix B

Methods Available for Resolving or Preventing Waterfowl Damage in the Commonwealth of Virginia

The most effective approach to resolving wildlife damage problems is to integrate the use of several methods, either simultaneously or sequentially. An Integrated Wildlife Damage Management (IWDM) plan would integrate and apply practical methods of prevention and reduce damage by wildlife while minimizing harmful effects of damage reduction measures on humans, other species, and the environment. IWDM may incorporate resource management, physical exclusion and deterrents, and population management, or any combination of these, depending on the characteristics of specific damage problems.

In selecting damage management techniques for specific damage situations, consideration is given to the responsible species and the magnitude, geographic extent, duration and frequency, and likelihood of wildlife damage. Consideration is also given to the status of target and potential non-target species, local environmental conditions and impacts, social and legal aspects, and relative costs of damage reduction options. The cost of damage reduction may sometimes be a secondary concern because of the overriding environmental, legal, and animal welfare considerations. These factors are evaluated in formulating damage management strategies that incorporate the application of one or more techniques.

A variety of methods are potentially available to the WS program in Virginia relative to the management or reduction of damage from waterfowl. Various federal, Commonwealth, and local statutes and regulations and WS directives govern WS' use of damage management tools and substances. WS develops and recommends or implements IWDM strategies based on resource management, physical exclusion, and wildlife management approaches. Within each approach there may be available a number of specific methods or tactics. The following methods and materials may be recommended or used in technical assistance and direct damage management efforts of the WS program in Virginia.

RESOURCE MANAGEMENT

Resource management includes a variety of practices that may be used by resource owners to reduce the potential for wildlife damage. Implementation of these practices is appropriate when the potential for damage can be reduced without significantly increasing a resource owner's costs or diminishing his/her ability to manage resources pursuant to goals. Resource management recommendations are made through WS technical assistance efforts.

Habitat Alteration: Habitat alteration can be the planting of vegetation unpalatable to wildlife or altering the physical habitat (Conover and Kania 1991, Conover 1992). Conover (1991) found that even hungry Canada geese refused to eat some ground covers such as common periwinkle (*Vinca minor*), English ivy (*Hedera helix*) and Japanese pachysandra (*Pachysandra terminalis*). Planting less preferred plants or grasses to discourage geese from a specific area could work more effectively if good alternative feeding sites are nearby (Conover 1985). However, the manipulation of turf grass varieties in urban/suburban, heavy use situations such as parks, athletic fields and golf courses is often not feasible. Varieties of turf grass that grow well and can withstand regular mowing and regular/heavy human use include: Kentucky blue grass, red fescue, perennial bent grass, perennial rye grass and white clover. All of these grasses are appealing to most waterfowl. The turf grass varieties that are not appealing to geese such as tall fescue, orchard grass, and timothy do not withstand regular mowing and/or regular/heavy human use.

Fences, hedges, shrubs, boulders, and other structures can be placed at shorelines to impede waterfowl movements. Restricting a bird's ability to move between water and land would deter them from an area, especially during molts (Gosser et al. 1997). However, people are often reluctant to make appropriate landscape modifications to discourage waterfowl activity (Breault and McKelvey 1991, Conover and Kania 1991). Unfortunately, both humans and geese appear to find lawn areas near water attractive (Addison and Amernic 1983), and conflicts between humans and geese would likely continue wherever this interface occurs.

Removal of water bodies would likely reduce the attractiveness of an area to geese. Urban/suburban geese tend to feed near bodies of water with a distant view over short grass (Conover and Kania 1991). Draining/removal of water bodies are considered unreasonable and aesthetically unacceptable. The draining of wetlands is strictly regulated by the U.S. Army Corps of Engineers and the Department of Environmental Protection.

Lure Crops: Lure crops are food resources planted to attract wildlife away from more valuable resources (*e.g.*, crops). This method is largely ineffective for urban geese since food resources (turf) are readily available. For lure crops to be effective, the ability to keep birds from surrounding fields would be necessary, and the number of alternative feeding sites must be minimal (Fairaizl and Pfeifer 1988). Additionally, lure crops reduce damage for only a short time (Fairaizl and Pfeifer 1988) and damage by geese is generally continuous. The resource owner is limited in implementing this method contingent upon ownership of or other ability to manage the property. Unless the original goose-human conflict is resolved, creation of additional goose habitat could increase future conflicts.

Lure crops may be planted on some land held in private ownership, such as conservation clubs, throughout Virginia. These plantings may provide some additional food or act as an attractant for waterfowl. However, it is highly unlikely that they contribute to reducing conflicts or act as significant attractants.

Modify Human Behavior: Artificial feeding of waterfowl by humans attracts and sustains more birds in an area than could normally be supported by natural food supplies. This unnatural food source exacerbates damage by waterfowl. The elimination of feeding of waterfowl is a primary recommendation made by WS. The Code of Virginia allows localities to adopt and enforce ordinances that prohibit the feeding of waterfowl, and some local municipalities and homeowners associations have taken advantage of this legislation. Some parks have posted signs, and there have been efforts made to educate the public on the negative aspects of feeding waterfowl. However, sometimes people do not comply, and the policies are poorly enforced in some areas.

Alternatively, some entities do not prohibit the feeding of geese because the goose population in the location has not exceeded the WAC. It is unlikely that the feeding of waterfowl in these locations would significantly contribute to conflicts with waterfowl in other communities or locations.

Alter Aircraft Flight Patterns: In cases where the presence of waterfowl at airports results in threats to human safety, and when such problems cannot be resolved by other means, the alteration of aircraft flight patterns or schedules may be recommended. However, altering operations at airports to decrease the potential for bird strike hazards is not feasible unless an emergency situation exists. Otherwise, the expense of interrupted flights and the limitations of existing facilities generally make this practice prohibitive.

Removal of Domestic Waterfowl: Flocks of urban/suburban domestic waterfowl are known to act as decoys and attract other migrating waterfowl (Crisley et al. 1968, Woronecki 1992). Avery (1994) reported that birds learn to locate food resources by watching the behavior of other birds. The removal of

domestic waterfowl from water bodies removes birds that act as decoys in attracting other waterfowl. Domestic waterfowl could also carry diseases which threaten wild populations. Property or resource owners may be reluctant to remove some or all decoy birds because of the enjoyment of their presence.

PHYSICAL EXCLUSION AND DETERRENTS

Physical exclusion and deterrents restrict the access of wildlife to resources and/or alter the behavior of target animals to reduce damage. These methods provide a means of appropriate and effective prevention of waterfowl damage in many situations. When threatened and endangered species exist on a site, certain methods would not be incorporated in management plans. Exclusion and/or scare devices would not be used in areas that are frequented by threatened and endangered species.

Electric Fence: The application of electrified fencing is generally limited to rural settings, due to the possibility/likelihood of interaction with people and pets. Limits of this application arise where there are multiple landowners along the wetland, pond, or lake, the size of the area, and its proximity to bodies of water used by waterfowl. Perceptions from Minnesota on the effectiveness of electric fences were high (Cooper and Keefe 1997). While electric fencing may be effective in repelling waterfowl in some urban settings, its use is often prohibited in many municipalities for human safety reasons. Problems that typically reduce the effectiveness of electric fences include; vegetation on fence, flight capable birds, fencing knocked down by other animals (*e.g.*, white-tailed deer and dogs), and poor power.

Barrier Fence: The construction or placement of physical barriers has limited application for waterfowl. Barriers can be temporary or permanent structures. Lawn furniture/ornaments, vehicles, boats, snow fencing, plastic hazard fencing, metal wire fencing, and multiple strand fencing have all been used to limit the movement of Canada geese. The application of this method is limited to areas that can be completely enclosed and do not allow waterfowl to land inside enclosures. Similar to most abatement techniques, this method has been most effective when dealing with small numbers of breeding geese and their flightless young along wetlands and/or waterways. Unfortunately, there have been situations where barrier fencing designed to inhibit goose nesting has entrapped young and resulted in starvation (Cooper 1998). The preference for geese to walk or swim, rather than fly, during this time period contributes to the success of barrier fences. Birds that are capable of full or partial flight render this method useless, except for enclosed areas small enough to prevent landing.

Surface Coverings: Waterfowl may be excluded from ponds using overhead wire grids (Fairaizl 1992, Lowney 1993). Overhead wire grids have been demonstrated to be most applicable on ponds of two acres or less, but wire grids may be considered aesthetically unappealing to some people. Wire grids render a pond unusable for boating, swimming, fishing, and other recreational activities. Installation costs are about $1,000 per surface acre for materials. The expense of maintaining wire grids may be burdensome for some people.

Plastic balls approximately five inches in diameter can be used to cover the surface of a pond. A “ball blanket” renders a pond unusable for boating, swimming, fishing, and other recreational activities. This method is very expensive, costing about $131,000 per surface acre of water.

Visual Deterrents: Reflective tape has been used successfully to repel some birds from crops when spaced at three to five meter intervals (Bruggers et al. 1986, Dolbeer et al. 1986). Mylar flagging has been reported effective at reducing migrant Canada goose damage to crops (Heinrich and Craven 1990). Flagging is impractical in many locations and has met with some local resistance due to the negative aesthetic appearance presented on the properties where it is used. Other studies have shown reflective tape ineffective (Bruggers et al. 1986, Dolbeer et al. 1986, Tobin et al. 1988, Conover and Dolbeer 1989).

While sometimes effective for short periods of time, reflective tape has proven mostly ineffective in deterring resident Canada geese.

Mute Swans: Mute swans are ineffective at preventing Canada geese from using or nesting on ponds (Conover and Kania 1994). Additionally, swans can be aggressive toward humans (Conover and Kania 1994, Chasko 1986) and may have undesirable effects on native aquatic vegetation (Chasko 1986). Executive Order 13112 states that federal agencies shall encourage states, local governments, and private citizens to prevent the introduction of exotic species into the environment. The use of mute swans as a Canada goose damage management technique is ineffective, and not recommended. The purchase, possession of, or release of mute swans in Virginia requires a permit, though as of 2007 the VDGIF will no longer issue permits for mute swans.

Dogs: Dogs can be effective at harassing waterfowl and keeping them off of turf and beaches (Conover and Chasko 1985, Castelli and Sleggs 2000). Around water, this technique appears most effective when the body of water to be patrolled is less than two acres in size (Swift 1998). Although dogs can be effective in keeping waterfowl off of individual properties, they do not contribute to a solution for the larger problem of overabundant goose populations (Castelli and Sleggs 2000). Swift (1998) and numerous individuals in New Jersey have reported that when harassment with dogs ceases, the number of geese returns to pre-treatment numbers. WS has recommended and encouraged the use of dogs where appropriate.

Repellents: To use chemical repellents for waterfowl damage management in Virginia, regulations governing use of restricted chemicals must be followed.

Methyl Anthranilate (MA) (artificial grape flavoring used in foods and soft drinks for human consumption) could be used or recommended by WS as a waterfowl repellent. Methyl Anthranilate is a registered repellent for waterfowl and is marketed under the trade names ReJeX-iT and Bird Shield. The material has been shown to be nontoxic to bees (LD_{50} > 25 micrograms/bee[9]), nontoxic to rats in an inhalation study (LC_{50} > 2.8 mg/L[10]), and of relatively low toxicity to fish and other invertebrates. Methyl anthranilate is naturally occurring in concord grapes and in the blossoms of several species of flowers and is used as a food additive and perfume ingredient (Dolbeer et al. 1992). It has been listed as "*Generally Recognized as Safe*" by the FDA (Dolbeer et al. 1992).

Methyl anthranilate has been shown to be a promising repellent for many bird species (Dolbeer et al. 1993). It is registered for applications to turf or to surface water areas used by unwanted birds. Cummings et al. (1995) reported that MA repelled Canada geese from grazing turf for four days. However, Belant et al. (1996) found it ineffective as a grazing repellent when applied at 22.6 and 67.8 kg/ha which is the label rate and triple the label rate, respectively. MA is water soluble, therefore moderate to heavy rain or daily watering and/or mowing render MA ineffective.

Water surface and turf applications of MA are generally considered expensive. For example, the least intensive application rate required by label directions is 20 lbs. of product (8 lbs. active ingredient) per acre of surface water at a cost of about $64/lb., with re-treatment required every 3-4 weeks. The cost of treating turf areas would be similar on a per acre basis. Also, MA completely degrades in about 3 days when applied to water, which indicates the repellent effect is short-lived.

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

[10] An LC_{50} is the dosage in milligrams of material per liter of air required to cause death in 50% of a test population of a species through inhalation.

Another potentially more cost-effective method of MA application is by use of a fog-producing machine (Vogt 1997). The fog drifts over the area to be treated and is irritating to the birds while being non-irritating to any humans that might be exposed. Fogging applications must generally be repeated 3-5 times after the initial treatment before the birds abandon a treatment. Applied at a rate of about 0.25 l/acre of water surface, the cost is considerably less than when using the turf or water treatment methods.

Other Repellents. Research continues on other avian feeding repellents. A 50% anthraquinone product (FlightControl) shows promise for waterfowl (Dolbeer et al. 1998). Like MA, anthraquinone has low toxicity to birds and mammals. Activated charcoal has also been evaluated for use in deterring waterfowl damage, but it requires frequent re-application to effectively reduce waterfowl damage (Mason and Clark 1994). Further, laboratory and field trials are needed to refine minimum repellent levels and to enhance retention of treated vegetation (Sinnott 1998). Askham (1997) found that by only treating the initial 100 ft of turf from the waters edge across the entire waterline can deter use of the entire damaged area. This can reduce the high costs associated with the use of chemical deterrents.

Harassment/Hazing: Harassment or hazing reduces losses in those instances when the affected waterfowl move to a more acceptable area. Achieving that end has becomes more difficult as local waterfowl populations increase. Birds hazed from one area where they are causing damage frequently move to another area where they cause damage (Brough 1969, Conover 1984, Summers 1985, Swift 1998). Smith et al. (1999) noted that others have reported similar results, stating: "*biologists are finding that some techniques (e.g., habitat modifications or scare devices) that were effective for low to moderate population levels tend to fail as flock sizes increase and waterfowl become more accustomed to human activity*". Whitford (2003) used a combination of noise harassment, dogs, nest displacement, and visual harassment to chase geese from an urban park during the nesting season. Birds responded by dispersing and continued harassment with alarm calls prevented recolonization of the site during the nesting season. Generally speaking, birds tend to habituate to hazing techniques (Zucchi and Bergman 1975, Summers 1985, Aubin 1990). In some locations and circumstances, hazing is a useful component of a goose damage management program.

Scarecrows/Effigies: The use of effigies has had mixed results. Effigies depicting alligators, humans, floating swans and dead geese have been employed, with limited success for short time periods in small areas. An integrated approach (swan and predator effigies, distress calls and non-lethal chemical repellents) was found to be ineffective at scaring or repelling nuisance waterfowl (Conover and Chasko 1985). While Heinrich and Craven (1990) reported that using scarecrows reduced migrant Canada goose use of agricultural fields in rural areas, their effectiveness in scaring geese from urban/suburban areas is severely limited because geese are not afraid of humans as a result of nearly constant contact with people. In general, scarecrows are most effective when they are moved frequently, alternated with other methods, and are well maintained. However, scarecrows tend to lose effectiveness over time and become less effective as goose populations increase (Smith et al. 1999).

Distress Calls: Aguilera et al. (1991) found distress calls ineffective in causing migratory and resident geese to abandon a pond. Although, Mott and Timbrook (1988) reported distress calls as effective at repelling resident geese 100 meters from the distress unit, the birds would return shortly after the calls stopped. The repellency effect was enhanced when pyrotechnics were used with the distress calls. In some situations, the level of volume required for this method to be effective in urban/suburban areas would be prohibited by local noise ordinances. A similar device, which electronically generates sound, has proven ineffective at repelling migrant waterfowl (Heinrich and Craven 1990).

Lasers and Lights: The use of lasers as non-lethal avian damage control tools has been evaluated for a number of species (Blackwell et al. 2002). Research on this potential tool has been conducted in a replicated format only for double-crested cormorants (Glahn et al. 2000). Lasers were found to be only

moderately effective for harassing geese, with significant reduction in night roosting, but little to no reduction in diurnal activity at the site pre- and post-use (Sherman 2003). The integrated use of lasers as part of goose damage management programs by WS in Virginia may increase program effectiveness and would be incorporated as appropriate. Wide scale public use of lasers is not typically recommended at this time, pending additional research (on effectiveness and impacts) on its use as a waterfowl damage management tool. In some situations (neighborhoods, schools, hospitals), use of lasers may enhance integrated control programs since they are silent and do not fire a projectile.

Similarly to the use of lasers, application of spotlights to haze geese from night roosts has proven to be a moderately effective method. The benefits are similar to lasers with the potential for use in highly urban or residential areas without disturbing the pubic. It is a method that can be incorporated with other methods in integrated management plans (VerCauteren et al. 2003).

Pyrotechnics: Pyrotechnics (screamer shells, bird bombs, and 12-gauge cracker shells) have been used to repel many species of birds (Booth 1994). Aguilera et al. (1991) found 15mm screamer shells effective at reducing resident and migrant Canada geese use of areas in Colorado. However, Mott and Timbrook (1988) and Aguilera et al. (1991) doubted the efficacy of harassment and believed that moving the geese simply redistributed the problem to other locations.

Fairaizl (1992) and Conomy et al. (1998) found the effectiveness of pyrotechnics highly variable among different flocks of waterfowl. Some flocks in urban areas required continuous harassment throughout the day with frequent discharges of pyrotechnics. The waterfowl usually returned within hours. A minority of resident Canada goose flocks in Virginia showed no response to pyrotechnics (Fairaizl 1992). Some flocks of Canada geese in Virginia have shown quick response to pyrotechnics during winter months, suggesting migrant geese made up some or all of the flock (Fairaizl 1992). Shultz et al. (1988) reported fidelity of resident Canada geese to feeding and loafing areas is strong, even when heavy hunting pressure is ongoing. Mott and Timbrook (1988) concluded that the efficacy of harassment with pyrotechnics is partially dependent on availability of alternative loafing and feeding areas. Although one of the more effective methods of frightening geese away, more often than not pyrotechnics simply move geese to other areas. There are also safety and legal implications regarding their use. Discharge of pyrotechnics is inappropriate and prohibited in some urban/suburban areas of Virginia. Pyrotechnic projectiles can start fires, ricochet off buildings, pose traffic hazards, and trigger dogs to bark incessantly, annoy and possibly injure people. Use of pyrotechnics in certain municipalities would be constrained by local firearm discharge and noise ordinances.

Paintballs: Recreational paintball equipment may be used to supplement other harassment methods. Paintballs consist of a gelatin shell filled with a non-toxic glycol and water-based coloring that rapidly dissipates and is not harmful to the environment. A paintball marker (or gun) uses compressed CO_2 to propel paintballs an average of 280 feet per second, though they are not very accurate. The discharge of the paintball marker combined with the sound of paintballs hitting the ground or splashing in water may be effective in dispersing Canada geese, especially when combined with other harassment techniques. Though paintballs break easily and velocity rapidly decreases with distance, firing at close range is discouraged to avoid harming geese. As with pyrotechnics, use of paintballs may be restricted in some areas by local ordinances

Propane Cannons: Propane cannons produce a noise that is intended to represent a firearm discharge. Cannons are attached to a propane tank and regulated to discharge at certain intervals. Propane cannons are generally inappropriate for urban/suburban areas due to the repeated loud explosions, which many people would consider a serious and unacceptable nuisance and potential health threat (hearing damage). Although a propane cannon can be an effective dispersal tool for migrant waterfowl in agricultural

settings, resident waterfowl in urban areas are more tolerant of noise and habituate to propane cannons relatively quickly.

POPULATION MANAGEMENT

Potential methods of managing the local goose population include capture and relocation, contraception, egg destruction, hunting, shooting, and capture and euthanize. The advantages of lethal damage management by WS are that it would be applied directly to those waterfowl identified as causing the damage or threat, its effects are obvious and immediate, and it carries no risk that the birds would return or move and create conflicts elsewhere. The primary disadvantage is that it is sometimes more socially controversial than other techniques. The use of lethal methods to reduce waterfowl damage can be very effective at alleviating damage and the most economical approach to reducing damage when compared to non-lethal methods (Cooper and Keefe 1997). Additionally, capture and removal of waterfowl is the most cost efficient lethal method to reduce damage, except for hunting (Cooper and Keefe 1997). Moreover, the use of lethal methods has longer effectiveness than non-lethal methods because it would likely take months to years before the original local population level of waterfowl returned. Lethal methods would also reduce conflicts among resource owners whereas non-lethal actions only move the waterfowl among resource owners (*i.e.*, spread the damage) (Cooper and Keefe 1997, Smith et al. 1999), possibly leaving resource owners with the fewest financial means burdened with the geese and the damage.

Capture and Relocation: Waterfowl are live captured through the use of non-chemical (panel nets, rocket nets, drive traps, net guns, dip nets, by hand, etc.) or chemical (alpha-chloralose) methods. Upon capture, birds could be transferred to waterfowl crates for relocation to suitable habitat away from the capture site. To discourage the return of geese to capture sites the primary wing feathers of relocated geese are typically clipped. Geese with clipped wings are able to fly after their next molting.

Smith (1996) reported that groups of juvenile geese relocated from urban to rural settings can effectively eliminate these geese from urban areas, retain them at the release site, include them in the sport harvest, and expose them to higher natural mortality. Smith (1996) also reported that multiple survival models indicated that survival estimates of relocated juveniles were half of those of urban captured and released birds.

Ultimately, the relocation of resident geese from metropolitan communities can assist in the reduction of overabundant populations (Cooper and Keefe 1997), and has been accepted by the general public as a method of reducing goose populations to socially acceptable levels (Fairaizl 1992, Powell et al. 2003). In areas where interest in hunting is high, the potential exists for moving nuisance birds to more rural areas to supplement huntable populations. In addition, the removal of geese posing or likely to pose a hazard to air safety at airports has been demonstrated to reduce the population of local geese and decrease the number of flights through the airport operations airspace, resulting in increased air safety at the Minneapolis-St. Paul International Airport (Cooper 1991).

Relocation of resident geese has the potential to spread disease into populations of other and/or migrating waterfowl. As stated in the USFWS resident Canada goose management FEIS (2005), the American Association of Wildlife Veterinarians (undated) "*…discourages the practice of relocating nuisance or excess urban ducks, geese and swans to other parks or wildlife areas as a means of local population control*." Currently in Virginia, relocation of waterfowl is not considered an option. VDGIF discourages the practice and the Virginia WS program currently euthanizes all captured birds.

Sterilization: Although Canada geese have been successfully sterilized to prevent production of young, this method is only effective if the female does not form a bond with a different male. In addition,

vasectomies can only prevent the production of the mated pair. The ability to identify breeding pairs for isolation and to capture a male bird for vasectomization becomes increasingly difficult as the number of birds increase (Converse and Kennelly 1994). Geese have a long life span once they survive their first year (Cramp and Simmons 1977, Allan et al. 1995); leg-band recovery data indicate that some waterfowl live longer than 20 years. The sterilization of resident geese would not reduce the damage caused by the overabundance of the goose population since the population would remain relatively stable. Keefe (1996) estimated sterilization of a Canada goose to cost over $100 per bird. Additionally, a permit from the USFWS would be required to sterilize waterfowl or other migratory birds. Currently, aside from the scientific collecting permit, there is no permit mechanism available for operational reproductive control of waterfowl (C. Dwyer, USFWS pers. comm. 2010).

Nicarbazin (NCZ): OvoControl–G™ is an EPA registered reproductive inhibitor containing NCZ that can be used to reduce Canada goose egg production and viability. NCZ is registered for use at site specific locations in highly populated urban areas. The user of this chemical product must adhere to all EPA use restrictions. VerCauteren et al. (2000) examined the use of NCZ to reduce Canada goose egg production and viability, and found that NCZ did experimentally reduce egg viability, but that there were difficulties in delivery methods and acceptance of treated feed. NCZ is not currently registered for use in Virginia.

Nicarbazin is a complex of two compounds, 4,4'-dinitrocarbanilide (DNC) and 4,6-dimethyl-2-pyrimidinol (HDP) which interferes with the formation of the vitelline membrane that separates the egg yolk and egg white which prevents the development of an embryo inside the egg (EPA 2005). The active component of nicarbazin is the DNC compound with the HDP compound aiding in absorption of DNC into the bloodstream (EPA 2005). Nicarbazin was first developed to treat coccidiosis[11] outbreaks in broiler chickens and has been approved as a veterinary drug by the FDA since 1955 for use in chicken feed to prevent the protozoal disease coccidiosis (EPA 2005).

OvoControl® G (EPA Reg. No. 80224-5) is a restricted use pesticide registered for use to reduce the egg hatch of geese. The formulation for geese contains 0.5% of the active ingredient nicarbazin by volume as a ready-to-use bait for geese in urban areas and at airports only. Urban areas have been defined by the EPA as municipalities and surrounding areas with a population of 50,000 or more people (EPA 2005). Baiting can only occur by applicators certified by the Commonwealth and only in urban areas such as office parks, recreational parks, malls, hospitals, airports, golf courses, schools, hospitals, restaurants, and commercial sites.

Nicarbazin has been studied as a reproductive inhibitor to reduce the number of geese at problem sites (VerCauteran et al. 2000). Population management from the use of reproductive inhibitors to decrease the hatchability of eggs laid occurs through a reduction in the recruitment of new birds into the population by limiting reproductive output. A reduction in the population occurs when the number of birds being recruited into the population cannot replace those individuals that die from other causes each year which equates to a net loss in the number of individuals in the population leading to a reduction in the overall population. Although not generally considered a lethal method since no direct take occurs, reproductive inhibitors can result in the reduction of a target species' population, primarily on a local scale. WS' use or recommendation of nicarbazin would target local goose populations identified as causing damage or threatening human safety. Although a reduction in local goose populations would likely occur from constant use of nicarbazin, the actual reduction in the local population annually would be difficult to derive prior to the initiation of the use of nicarbazin.

[11]Coccidiosis is a fungal pathogen known to infect birds and livestock causing diarrhea, dehydration, and can prevent proper growth of livestock. For more information on coccidiosis, see the EA (USDA 2000).

One of the difficulties in calculating an actual reduction in a targeted population prior to application of the bait is that consumption of nicarbazin treated bait as currently formulated does not appear to completely eliminate egg hatch in geese. Current studies on nicarbazin as a reproductive inhibitor has shown variability in hatch rates of target species fed treated baits (VerCauteren et al. 2000, Bynum et al. 2005, Yoder et al. 2006). In addition, geese must consume bait treated with nicarbazin daily in the correct dosage throughout the breeding season to achieve the highest level of effectiveness in reducing egg hatch. Resident Canada geese generally nest from February through June each year (USFWS 2005).

Since the effects of nicarbazin on egg hatch are reversible if no longer provided for consumption, the reduction in a local population of geese from the use of nicarbazin can be maintained at appropriate levels where damages or threats are resolved by increasing or decreasing the amount of nicarbazin treated bait available to target geese. Although localized goose populations would likely be reduced from the use of nicarbazin, the extent of the reduction would be variable given the uncertainty in effectiveness of nicarbazin to reduce egg hatch. When geese were provided nicarbazin at dosage levels found formulated in OvoControl® G, not all eggs laid were infertile (VerCauteren et al. 2000, Bynum et al. 2005, Yoder et al. 2006).

Egg Destruction/Reproduction Control: Egg addling, oiling, freezing, egg replacement, or puncturing can be effective in reducing recruitment into the local population (Christens et al. 1995, Cummings et al. 1997). Throughout the goose nesting season, eggs may be treated or destroyed to eliminate reproduction on the site, which may slow the growth of the local population and increase the effects of harassment activities. Geese typically lay one egg every 1-2 days for a total of 4-8 eggs/nest; the incubation period for goose eggs is approximately 28 days.

While egg removal/destruction can reduce production of young, merely destroying an egg does not reduce a population as quickly as removing immature or breeding adults (Cooper and Keefe 1997). Approximately five eggs must be removed to have the effect of stopping one adult from joining the breeding population (Rockwell et al. 1997, Schmutz et al. 1997). Keefe (1996) estimated egg destruction to cost $40 for the equivalent of removing one adult goose from the population. To equal the effect of removing an adult bird from a population, all eggs produced by that bird during its entire lifetime must be removed (Smith et al. 1999). Furthermore, egg removal efforts must be nearly complete in order to prevent recruitment from a small number of surviving nests that would offset control efforts (Smith et al. 1999). Cooper and Keefe (1997), Rockwell et al. (1997), and Schmutz et al. (1997) reported that egg destruction is only fractionally effective in attaining population reduction objectives, and that nest/egg destruction is not an efficient or cost-effective damage management or population reduction approach.

The Atlantic Flyway Resident Canada Goose Management Plan (Atlantic Flyway Council 1999), states that to effectively reduce resident goose populations, an increase in adult and immature mortality rates, combined with reproductive control, is necessary. Reproductive control alone can not reduce the population in an acceptable time; treatment of 95% of all eggs each year would result in only a 25% reduction over 10 years (Allan et al. 1995). In contrast, reducing annual survival of resident Canada geese by just 10% would reduce a predicted growth rate of more than 15% per year to a stable population, assuming moderate recruitment (Atlantic Flyway Council 1999). In addition, egg destruction is estimated to cost significantly more than other forms of population management (Cooper and Keefe 1997). Egg destruction, while a valuable tool, has fallen short as a single method for reducing local waterfowl populations. Many nests cannot be found by resource managers in typical urban-suburban settings due to the difficulties in gaining access to search the hundreds of private properties where nests may occur. In addition, waterfowl which have eggs oiled in successive years may learn to nest away from the water making it more difficult to find nests.

VerCauteren et al. (2000) and VerCauteren and Marks (2004) examined the use of NCZ to reduce Canada goose egg production and viability, and found that NCZ did experimentally reduce egg viability, but that there were difficulties in delivery methods and acceptance of treated feed. Additional research and field trials to document the extent to which NCZ is effective and practical as an operational population management tool are needed before this material is available to wildlife managers in field applications. Other methods that reduce hatch rate have been developed and tested recently. Hill and Craven (2003) found that conjugated linoleic acid when used in controlled experiments significantly reduced hatch rate dependant on dosage, but suggest there are application obstacles related to widespread application in the field.

Capture with Alpha Chloralose: Alpha chloralose (AC) is a central nervous system depressant used as an immobilizing agent to capture and remove pigeons, waterfowl and other birds. It is labor intensive and in some cases, may not be cost effective (Wright 1973, Feare et al. 1981). Alpha chloralose is typically delivered as well contained bait in small quantities with minimal hazards to pets and humans; single bread or corn baits are fed directly to the target birds. WS personnel are present at the site of application during baiting to retrieve the immobilized birds. Unconsumed baits are removed from the site following each treatment. Alpha chloralose was eliminated from more detailed analysis in WS' programmatic FEIS (USDA 1997) based on critical element screening; therefore, environmental fate properties of this compound were not rigorously assessed. However, the solubility and mobility are believed to be moderate and environmental persistence is believed to be low. Bioaccumulation in plants and animal tissue is believed to be low. The compound is slowly metabolized, with recovery occurring a few hours after administration (Schafer 1991). The dose used for immobilization is designed to be about two to 30 times lower than the LD_{50}. Mammalian data indicate higher LD_{50} values than birds. Toxicity to aquatic organisms is unknown (Woronecki et al. 1990), but the compound is generally not soluble in water and, therefore, should remain unavailable to aquatic organisms. Factors supporting the determination of this low potential included the lack of exposure to pets, non-target species, and the public, and the low toxicity of the active ingredient. Other supporting rationale for this determination included relatively low total annual use and a limited number of potential exposure pathways. The agent is currently approved for use by WS as an INAD by the FDA, rather than as a pesticide.

Alpha chloralose may be used only by WS personnel to live capture waterfowl. Pursuant to FDA restrictions, waterfowl captured with AC for subsequent euthanasia must be killed and buried or incinerated, or be held alive for at least 30 days, at which time the birds may be killed and processed for human consumption.

Toxicants: All pesticides are regulated by the EPA. There are currently no toxicants registered with the EPA for use on waterfowl and therefore none would be used by WS.

Hunting: Where appropriate, WS recommends that resource owners consider legal hunting as an option for reducing waterfowl damage. Although legal hunting is impractical and/or prohibited in many urban-suburban areas, it can be used to reduce some populations of resident geese. Legal hunting also reinforces harassment programs (Kadlec 1968). Zielske et al. (1993) believed legal hunting would not reduce resident Canada geese populations where there is limited interest in legally hunting resident geese. However, hunting has had a major impact on the distribution of geese in the Minneapolis-St. Paul Metro Area of Minnesota (Cooper and Keefe 1997). They reported goose densities during the summer in hunted areas of the Metro Area (which comprised only 23% of the area) were significantly lower (three times lower) than densities in areas that were not hunted. Similarly, Conover and Kania (1991) reported that Canada geese were more likely to cause damage in areas that waterfowl hunting was prohibited. Even in urban/suburban areas (*e.g.*, golf courses and green spaces) there may be locations where controlled hunting would be effective in reducing goose damage. In Virginia, Canada geese are legally harvested during three seasons: the September season, the regular season, and late season.

Shooting: Shooting waterfowl can be highly effective in removing birds from specific areas and in supplementing harassment. Shooting is the practice of selectively removing target birds using firearms. Shooting a few individuals from a larger flock can reinforce birds' fear of harassment techniques. Shooting is used to reduce waterfowl damage when lethal methods are determined to be appropriate. The birds are killed as quickly and humanely as possible. In Virginia, shooting geese pursuant to a depredation permit is conducted primarily by farmers, airport personnel, municipal and county park personnel, and others.

Capture and Euthanize: The most efficient way to reduce the size of resident waterfowl population is to increase mortality among adult geese. Nationwide, hunting is the major cause of waterfowl mortality, but waterfowl may seldom be available to hunters in an urban-suburban environment (Conover and Chasko 1985, Smith et al. 1999). For purposes of lethal control, waterfowl are usually captured with panel nets, rocket nets, drive traps, net guns, dip nets, and/or by hand. Panel nets as described by Costanzo et al. (1995) are lightweight, portable panels (approximate size 4' x 10') that are used to herd and surround waterfowl into a moveable catch pen. This method is equally efficient on hard (pavement) and soft (field) surfaces, and can be employed in such a way as to reduce stress on captured birds (place the catch pen in a shaded area) and control other impacts (place far from roadways). Rocket netting involves the setting of bait in an area that would be completely contained within the dimensions of a manually propelled net. The launching of the rocket net occurs too quickly for the birds to escape. Rocket netting may take place anytime during the year. Using a net gun to capture waterfowl can be conducted anytime during the year by firing a net from a shoulder mounted gun. Canada geese that are captured and euthanized would be buried, incinerated, or processed for charitable donation.

Appendix C
Federal and Commonwealth Threatened and Endangered Species

Federal Threatened and Endangered Species in the Commonwealth of Virginia

Listings and occurrences for Virginia

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.

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

Status	Species
E	Bat, gray (*Myotis grisescens*)
E	Bat, Indiana (*Myotis sodalis*)
E	Bat, Virginia big-eared (*Corynorhinus (=Plecotus) townsendii virginianus*)
E	Bean, purple (*Villosa perpurpurea*)
E	Blossom, green (pearlymussel) (*Epioblasma torulosa gubernaculum*)
T	Chub, slender (*Erimystax cahni*)
T	Chub, spotfin Entire (*Erimonax monachus*)
E	Combshell, Cumberlandian Entire Range; Except where listed as Experimental Populations (*Epioblasma brevidens*)
E	Darter, duskytail Entire (*Etheostoma percnurum*)
E	Fanshell (*Cyprogenia stegaria*)
E	Isopod, Lee County cave (*Lirceus usdagalun*)
T	Isopod, Madison Cave (*Antrolana lira*)
E	Logperch, Roanoke (*Percina rex*)
T	Madtom, yellowfin except where EXPN (*Noturus flavipinnis*)
E	Monkeyface, Appalachian (pearlymussel) (*Quadrula sparsa*)
E	Monkeyface, Cumberland (pearlymussel) Entire Range; Except where listed as Experimental Populations (*Quadrula intermedia*)
E	Mussel, oyster Entire Range; Except where listed as Experimental Populations (*Epioblasma capsaeformis*)
E	Pearlymussel, birdwing Entire Range; Except where listed as Experimental Populations (*Conradilla caelata*)
E	Pearlymussel, cracking Entire Range; Except where listed as Experimental Populations (*Hemistena lata*)
E	Pearlymussel, dromedary Entire Range; Except where listed as Experimental Populations (*Dromus dromas*)
E	Pearlymussel, littlewing (*Pegias fabula*)
E	Pigtoe, finerayed Entire Range; Except where listed as Experimental Populations (*Fusconaia cuneolus*)

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

Status	Species
E	Pigtoe, rough (*Pleurobema plenum*)
E	Pigtoe, shiny Entire Range; Except where listed as Experimental Populations (*Fusconaia cor*)
T	Plover, piping except Great Lakes watershed (*Charadrius melodus*)
E	Rabbitsfoot, rough (*Quadrula cylindrica strigillata*)
E	Riffleshell, tan (*Epioblasma florentina walkeri (=E. walkeri)*)
E	Salamander, Shenandoah (*Plethodon shenandoah*)
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	Snail, Virginia fringed mountain (*Polygyriscus virginianus*)
E	Spinymussel, James (*Pleurobema collina*)
E	Squirrel, Delmarva Peninsula fox Entire, except Sussex Co., DE (*Sciurus niger cinereus*)
E	Sturgeon, shortnose (*Acipenser brevirostrum*)
E	Tern, roseate northeast U.S. nesting pop. (*Sterna dougallii dougallii*)
T	Tiger beetle, northeastern beach (*Cicindela dorsalis dorsalis*)
E	Wedgemussel, dwarf (*Alasmidonta heterodon*)
E	Whale, finback (*Balaenoptera physalus*)
E	Whale, humpback (*Megaptera novaeangliae*)
E	Whale, right (*Balaena glacialis (incl. australis)*)
E	Woodpecker, red-cockaded (*Picoides borealis*)

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

Status	Species
E	Bean, Cumberland (pearlymussel) Entire Range; Except where listed as Experimental Populations (*Villosa trabalis*)
E	Beetle, American burying (*Nicrophorus americanus*)
E	Curlew, Eskimo (*Numenius borealis*)
E	Mucket, pink (pearlymussel) (*Lampsilis abrupta*)
E	Puma (=cougar), eastern (*Puma (=Felis) concolor couguar*)
E	Wolf, gray Lower 48 States, except where delisted and where EXPN. Mexico. (*Canis lupus*)

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

Status	Species
E	Spider, spruce-fir moss (*Microhexura montivaga*)

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

Status	Species
T	Amaranth, seabeach (*Amaranthus pumilus*)
T	Birch, Virginia round-leaf (*Betula uber*)
E	Bittercress, small-anthered (*Cardamine micranthera*)
E	Bulrush, Northeastern (*Scirpus ancistrochaetus*)
E	Coneflower, smooth (*Echinacea laevigata*)
T	Joint-vetch, sensitive (*Aeschynomene virginica*)
E	Mallow, Peter's Mountain (*Iliamna corei*)
T	Orchid, eastern prairie fringed (*Platanthera leucophaea*)
T	Pink, swamp (*Helonias bullata*)
T	Pogonia, small whorled (*Isotria medeoloides*)
E	Rock-cress, shale barren (*Arabis serotina*)
T	Sneezeweed, Virginia (*Helenium virginicum*)
T	Spiraea, Virginia (*Spiraea virginiana*)
E	Sumac, Michaux's (*Rhus michauxii*)

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

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

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

Status	Species
E	Harperella (*Ptilimnium nodosum*)

State listed Threatened and Endangered Species in the Commonwealth of Virginia[1]

Common Name	Scientific Name	State status
Kemp's ridley sea turtle	*Lepidochelys kempii*	SE
Leatherback sea turtle	*Dermochelys coriacea*	SE
Loggerhead sea turtle	*Caretta caretta*	ST
Wood turtle	*Glyptemys insculpta*	ST
Bachman's sparrow	*Aimophila aestivalis*	ST
Bachman's warbler (=wood)	*Vermivora bachmanii*	SE
Bald eagle	*Haliaeetus leucocephalus*	ST
Bewick's wren	*Thryomanes bewickii*	SE
Gull-billed tern	*Sterna nilotica*	ST
Henslow's sparrow	*Ammodramus henslowii*	ST
Kirtland's warbler (=wood)	*Dendroica kirtlandii*	SE
Loggerhead shrike	*Lanius ludovicianus*	ST
Peregrine falcon	*Falco peregrinus*	ST
Piping plover	*Charadrius melodus*	ST
Red-cockaded woodpecker	*Picoides borealis*	SE

Roseate tern	*Sterna dougallii dougallii*	SE
Upland sandpiper	*Bartramia longicauda*	ST
Wilson's plover	*Charadrius wilsonia*	SE
American water shrew	*Sorex palustris*	SE
Carolina northern flying squirrel	*Glaucomys sabrinus coloratus*	SE
Delmarva Peninsula fox squirrel	*Sciurus niger cinereus*	SE
Dismal Swamp southeastern shrew	*Sorex longirostris fisheri*	ST
Eastern puma (=cougar)	*Puma* (=*Felis) concolor cougar*	SE
Gray bat	*Myotis grisescens*	SE
Gray wolf	*Canis lupus*	SE
Indiana bat	*Myotis sodalis*	SE
Rafinesque's eastern big-eared bat	*Corynorhinus rafinesquii macrotis*	SE
Rock vole	*Microtus chrotorrhinus*	SE
Snowshoe hare	*Lepus americanus*	SE
Virginia big-eared bat	*Corynorhinus* (= *Plecotus) townsendii virginianus*	SE
Virginia northern flying squirrel	*Glaucomys sabrinus fuscus*	SE
Appalachian monkeyface (pearlymussel)	*Quadrula sparsa*	SE
Atlantic pigtoe	*Fusconaia masoni*	ST
Birdwing pearlymussel	*Conradilla caelata* (= *Lemiox rimosus*)	SE
Black sandshell	*Ligumia recta*	ST
Brook floater	*Alasmidonta varicosa*	SE
Cracking pearlymussel	*Hemistena lata*	SE
Cumberland bean (pearlymussel)	*Villosa trabalis*	SE
Cumberland monkeyface (pearlymussel)	*Quadrula intermedia*	SE
Cumberlandian combshell	*Epioblasma brevidens*	SE
Deertoe	*Truncilla truncata*	SE

S/A=Similarity of Appearance; SOC=Federal Species of Concern (not a legal status; list maintained by USFWS Virginia Field Office); SE=State Endangered; ST=State Threatened; SSC=State Special Concern (not a legal status).

1Information obtained from http://www.dgif.virginia.gov/wildlife/virginiatescspecies.pdf, April 16, 2010.