ENVIRONMENTAL ASSESSMENT

Managing Damage to Resources and Threats to Human Health and Safety Caused by Birds 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 the Interior
United States Fish and Wildlife Service
Migratory Bird Program
Interior Region 1 (Legacy Region 5)

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ACRONYMS

APHIS	Animal and Plant Health Inspection Service
APMV-1	Avian paramyxovirus 1
AVMA	American Veterinary Medical Association
BBS	Breeding Bird Survey
BCR	Bird Conservation Regions
CAB	Civil Aeronautics Board
CBC	Christmas Bird Count
CDC	U.S. Department of Health and Human Services, Centers for Disease Control and Prevention
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CSA	Cooperative Service Agreement
CY	Calendar year
DEA	U.S. Department of Justice, Drug Enforcement Administration
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FAA	U.S. Department of Transportation, Federal Aviation Administration
FDA	U.S. Department of Health and Human Services, Food and Drug Administration
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FONSI	Finding of No Significant Impact
FR	Federal Register
FY	Fiscal year
HMANA	Hawk Migration Association of North America
IWDM	Integrated Wildlife Damage Management
MANEM	Mid-Atlantic / New England / Maritimes Region Waterbird Working Group
MBTA	Migratory Bird Treaty Act
MIS	Management Information System
MOU	Memorandum of Understanding
NAGPRA	Native American Graves Protection and Repatriation Act
NASS	U.S. Department of Agriculture, National Agricultural Statistics Service
NAHMS	U.S. Department of Agriculture, National Animal Health Monitoring System
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMFS	U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service
NOAA	U.S. Department of Commerce, National Oceanic and Atmospheric Administration
NRCS	U.S. Department of Agriculture, Natural Resource Conservation Service
NWRC	U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Services, National Wildlife Research Center
ODNR	Ohio Department of Natural Resources, Division of Wildlife
PIF	Partners in Flight
PPE	Personal Protective Equipment
USAF	U.S. Department of the Air Force
USC	U.S. Code
USDA	U.S. Department of Agriculture
USN	U.S. Department of the Navy
USFWS	U.S. Department of the Interior, U.S. Fish and Wildlife Service

USGS	U.S. Geological Survey
SPITS	Service Permit Issuance and Tracking System (U.S. Fish and Wildlife Service)
SOPs	Standard Operating Procedures
VAC	Virginia Administrative Code
VBBAP	Virginia Breeding Bird Atlas Project
VDACS	Virginia Department of Agriculture and Consumer Services
VDEQ	Virginia Department of Environmental Quality
VDGIF	Virginia Department of Game and Inland Fisheries
VDH	Virginia Department of Health
VDWR	Virginia Department of Wildlife Resources
WBPHS	Waterfowl Breeding Population and Habitat Survey
WS	U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Services
WS-Virginia	U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Services Program in Virginia

CHAPTER 1: PURPOSE AND NEED FOR ACTION

INTRODUCTION

Conflicts between humans and wildlife develop when an action by humans or wildlife has a negative impact upon the other (Conover 2002). Human-wildlife conflict issues are complicated by the wide range of public responses to wildlife and the negative impacts of wildlife (i.e., wildlife damage). What may be unacceptable damage to one person may be a normal cost of living with nature to someone else. The relationship of wildlife values and damage can be summarized in this way:

Wildlife has either positive or negative values, depending on varying human perspectives and circumstances (Brown and Manfredo 1987). Wildlife is generally regarded as providing utilitarian, economic, recreational, scientific, ecological, and aesthetic benefits, and the mere knowledge that animals exist is a positive benefit to many people (Conover 2002). However, the presence of wildlife does not always benefit people, it sometimes results in risks and costs (i.e., damage) (Decker et al. 2019). Sensitivity to varying perspectives and values is required to manage and balance the needs of humans and the needs of wildlife. In addressing conflicts, managers must consider not only the needs of those directly affected by damage but a range of other considerations.

This Environmental Assessment (EA) evaluates the potential environmental effects of alternatives for WS' involvement in managing conflicts occurring between humans and birds in Virginia. The U.S. Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), Wildlife Services (WS) program is the federal agency authorized to protect American resources from damage associated with wildlife (the Act of March 2, 1931 (7 USC 8351-8352) as amended, and the Act of December 22, 1987 (7 USC 8353)).

WS is a cooperatively funded, service-oriented program that receives requests for assistance with damage caused by animals from private and public entities, including tribes and other governmental agencies. As requested, WS cooperates with land and animal management agencies to reduce damage effectively and efficiently in accordance with applicable federal, state, and local laws and Memoranda of Understanding (MOUs) between WS and other agencies.

WS' activities are conducted to prevent or reduce damage to agriculture, property and natural resources, and threats to public health and safety on private and public lands in cooperation with federal, state and local agencies, tribes, private organizations, and individuals. The WS program uses an integrated approach (WS Directive 2.105)[1] in which a combination of methods may be used or recommended to reduce damage. Program activities are not based on punishing offending animals but are conducted to reduce damage and risks and are used as part of the WS Decision Model (Slate et al. 1992).

WS chose to prepare this EA in cooperation with the U.S. Fish and Wildlife Service (USFWS) to facilitate planning, interagency coordination and the streamlining of program management, and to clearly communicate with the public the analysis of direct, indirect, and cumulative impacts. In addition, this EA has been prepared to evaluate and determine if there are any potentially significant or cumulative impacts from the proposed damage management program. Pursuant to the National Environmental Policy Act (NEPA) (Public Law 9-190, 42 USC 4321 et seq.) and the Council on Environmental Quality (CEQ)

[1] WS Program Directives are available at https://www.aphis.usda.gov/aphis/ourfocus/wildlifedamage/SA_WS_Program_Directives.

regulations, WS is preparing this EA[2] to document the analyses associated with proposed federal actions and to inform decision-makers and the public of reasonable alternatives capable of avoiding or minimizing significant effects. This EA will also serve as a decision-aiding mechanism to ensure that the policies and goals of the NEPA are infused into the actions of the agency.

NEED FOR ACTION

WS continues to receive requests for assistance to resolve or prevent damage occurring to agricultural resources, natural resources, property, and reduce or prevent threats to human health and safety associated with species of birds (see Appendix B for species addressed by this document). This EA will assist in determining if the proposed management of bird damage could have a significant impact on the human environment based on previous activities conducted and based on the anticipation of receiving additional requests for assistance. Because the goal of WS is to conduct a coordinated program in accordance with plans and objectives developed to reduce damage, and because this goal and these objectives are to provide services when requested, within the constraints of available funding and workforce, it is conceivable that additional damage management efforts could occur. Thus, this EA anticipates those additional efforts and the analyses are intended to apply to actions that may occur in any locale and at any time within Virginia as part of a coordinated program.

Changes in the need for action and the affected environment have prompted WS to initiate this new analysis to address damage or threats associated with birds 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.

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

Both sociological and biological carrying capacities must be applied to resolve damage problems. The animal acceptance capacity, or cultural carrying capacity, is the limit of human tolerance for animals or the maximum number of a given species that can coexist compatibly with local human populations. The biological carrying capacity is the ability of the land or habitat to support healthy populations of animals without degradation to the species' health or their environment during an extended period of time (Decker and Purdy 1988). Those phenomena are especially important because they define the sensitivity of a person or community to a species. For any given damage situation, there are varying thresholds of tolerance exhibited by those people directly and indirectly affected by the species and any associated damage. This damage threshold determines the animal acceptance capacity. The available habitat may have a biological carrying capacity to support higher populations; however, in many cases the animal acceptance capacity is lower or has been reached. Once the animal acceptance capacity is reached or

[2] The CEQ defines an EA as documentation that "...(1) briefly provides sufficient evidence and analysis for determining whether to prepare an [Environmental Impact Statement]; (2) aids an agency's compliance with NEPA when no environmental impact statement is necessary; and (3) facilitates preparation of an Environmental Impact Statement when one is necessary" (Council on Environmental Quality 2007).

exceeded, people begin to implement population or damage management to alleviate damage or address threats to human health and safety.

The 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, forage) where they can find a niche. If their activities result in lost economic value of resources or threaten human safety, people characterize this as damage. When damage exceeds or threatens to exceed an economic threshold and/or poses a threat to human safety, people often seek assistance.

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

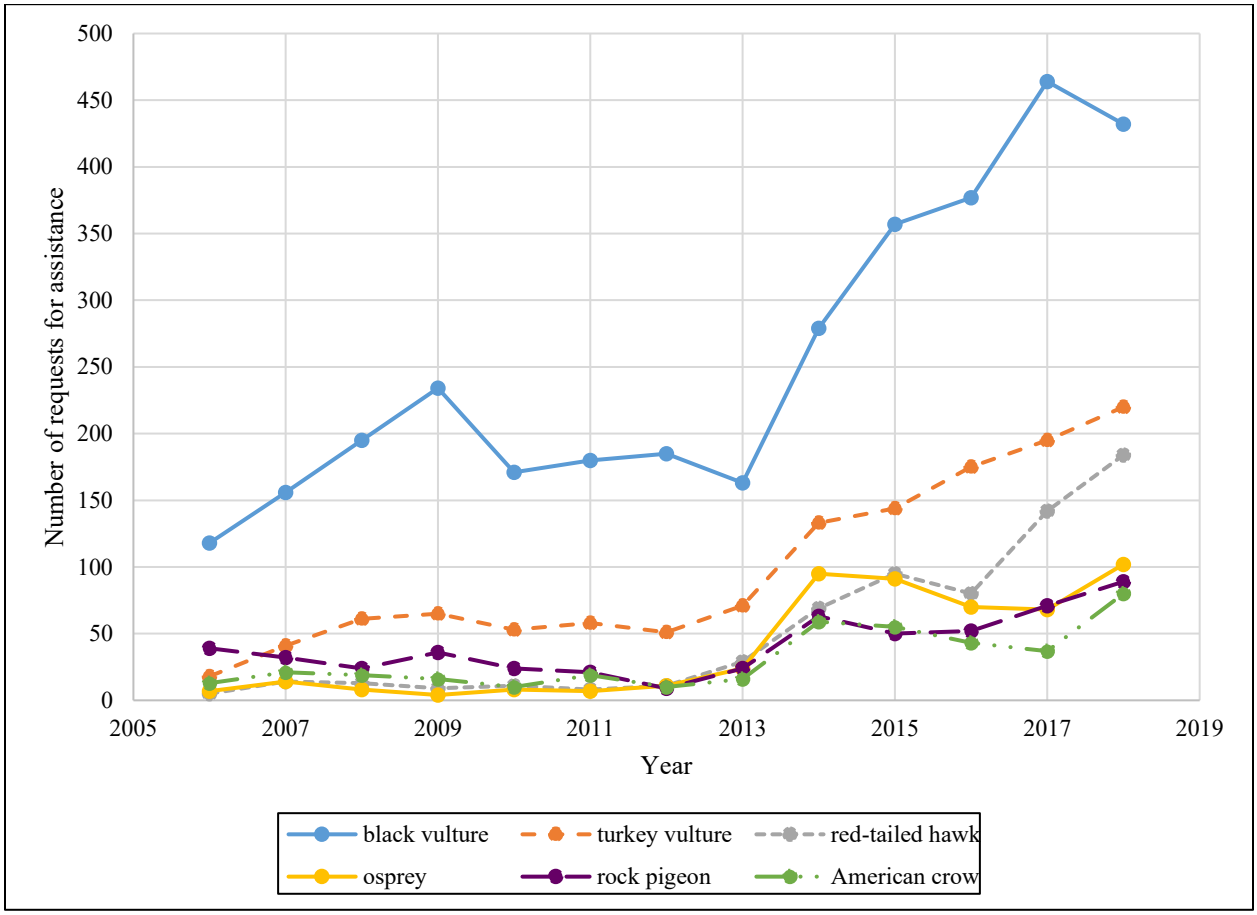
Managing damage caused by animals is often based on balancing animal populations and human perceptions in a struggle to preserve rare species, regulate species populations, oversee consumptive uses of animals, and conserve the environment that provides habitat. Animals are regarded as has having aesthetic, ecological, economic, educational, nutritional, scientific and socio-cultural values (Chardonnet et al. 2002), and there is enjoyment in knowing species exist and contribute to natural ecosystems (Decker et al. 2001). However, when the presence of an adaptable and opportunistic species is combined with human expansion, land management conflicts often develop.

Birds add an aesthetic component to the environment, provide essential ecological functions, sometimes provide opportunities for hunting, and provide people with a connection with nature. Many people, even those experiencing damage, consider the birds addressed in this EA to be a charismatic and valuable component of their environment. However, tolerance differs among individuals.

The need for action to manage damage and threats associated with birds arises from requests for assistance[3] received by WS to reduce and prevent damage. Requests for assistance with managing bird damage or threats of damage from federal fiscal year (FY) 2011 through FY 2018 were primarily related to black vultures, turkey vultures, red-tailed hawks, osprey, American crow and rock pigeons. These requests have increased over the last 12 years (Figure 1.1) as have requests for assistance with managing damage associated with other species addressed in this analysis.

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

Figure 1.1.- Number of requests for assistance to address damage associated with black vultures, turkey vultures, red-tailed hawks, osprey, rock pigeons and American crows received by WS FY 2006–2018[a]



[a]Data reported by federal fiscal year, obtained from WS' Management Information System (MIS) system.

Two forms of assistance have been provided by WS to those people requesting assistance with resolving damage or the threat of damage. Technical assistance is the provision of information, recommendations, and demonstrations on available and appropriate methods that could 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 2 of this EA. Direct operational assistance is the direct application of methods by WS. Direct operational assistance can only commence after technical assistance has been provided (see WS Directive 2.101, WS Directive 2.201) and those persons requesting assistance have been informed of their options (see WS Directive 3.101). WS' direct operational assistance activities will be discussed further in Chapter 2 of this EA. The numbers of requests for assistance are representative of the damage and threats that could be caused by birds. Many of the requests for assistance involved multiple resources and multiple species.

Appendix B lists species of birds addressed in this EA and the resource types that these species can cause damage to in Virginia. Many of the species of birds addressed in this EA can cause damage to or pose threats to more than one resource. Specific information regarding bird damage to agricultural resources, natural resources, property, and threats to human health and safety are discussed in the following subsections.

Need for Bird Damage Management to Reduce or Prevent Threats to Human Health and Safety

Requests received by WS for assistance in reducing or preventing threats to human health and safety from birds falls into three categories.

Threat of Disease Transmission

Zoonotic diseases are animal diseases which are transmissible to people. Disease transmission can occur from direct interactions between people and birds, ingestion (or inhalation) of contaminated material, or from interactions with pets and livestock that have direct contact with birds. Livestock can encounter and interact with birds, which can increase the possibility of transmission to people. Increased exposure to bird feces in areas where both birds and humans congregate (e.g., parks, recreational areas etc.) can also increase the possibility of transmission to people. Also, of concern, is the ability of birds to fly and transport disease causing organisms from one location to another. Disease transmission from birds to humans is uncommon. However, the infrequency of such transmissions does not diminish the concerns of those individuals requesting assistance because disease transmissions are documented and possible. Diseases which can be transmitted from birds to humans may be bacterial, spirochetal, rickettsial, viral, fungal, or parasites.

WS continues to receive requests for assistance from persons concerned about the potential risk of transmission of diseases to humans from birds. Under the proposed action, WS could provide both technical assistance and direct control to these persons. WS could also conduct or assist with the monitoring or surveillance of diseases in birds addressed in this EA. Most disease sampling would occur ancillary to other wildlife damage management activities (i.e., disease sampling occurs after birds have been captured or lethally removed for other purposes). WS may also sample birds captured or lethally removed by private or other government entities or dying from other causes (e.g., found dead).

This section includes brief descriptions of examples of zoonotic diseases for which WS could provide surveillance or management assistance. Additional examples of zoonotic diseases, their animal host and how humans become exposed are displayed in Table 1.1. Hosts are organisms that harbor or carry other organisms either externally or internally (e.g., parasites). This discussion is intended to briefly address the more commonly known zoonotic diseases associated with those species addressed in this EA. It is not intended to be an exhaustive discussion of all potential zoonotic diseases. The transmission of many zoonotic diseases from wildlife to humans is neither well documented nor well understood. Determining a vector for a human infected with a disease known to occur in wildlife populations is often complicated by the presence of the known agent across a broad range of naturally occurring sources. For example, a person with Salmonella poisoning may have contracted Salmonella bacterium from direct contact with an infected bird but may have also contracted the bacterium from other sources. Consequently, this list is not all-inclusive and new diseases may be identified in the future or may be introduced from other geographic areas.

Table 1.1 – Diseases that pose potential human health and safety risks through transmission to humans.

Disease (causative agent)	How humans contract from birds	Hosts*
Psittacosis or Ornithosis *(Chlamydia psittaci)*	Exposure to infected feces or nasal discharge[a,b]	Egrets, grackles, gulls, pigeons, raptors, shorebirds, others[a]
E. coli (*Escherichia coli*)	Swimming in contaminated water[c], indirect contact with contaminated materials[d]	Finches, gulls, pigeons, sparrows, European starlings[a]
Botulism *(Clostridium*	Handling of sick or dead animals,	Gulls, loons, others[e,f]

botulinum), type E	consumption[d,e]	
Salmonella (*enterica typhimurium*)	Consumption of or contact with contaminated materials or dead birds[g,h]	Crows, gulls, raptors, terns, others[a]
Mycobacterium (*M. avium, M. ulcerans)*	Exposure to birds, contaminated water[a]	Crows, raptors, pigeons[a]
Lyme Disease (*Borrelia burgdorferi spp.*)	Bite of an infected tick[a]	Numerous species[a]
Cryptococcus	Inhalation[e]	European starlings, pigeons[a]
Histoplasmosis	Inhalation[e]	Blackbirds[‡], pigeons[e]
West Nile Virus	Bite of an infected mosquito[a]	Blackbirds[‡], blue jays, crows, raptors, others[a,i,j]
St. Louis encephalitis virus	Bite of an infected mosquito[e]	American robins, common grackles, European starlings, house finches, house sparrows, mourning doves, others[a,e]
eastern and western equine encephalitis	Bite of an infected mosquito[a]	American robin, European starlings, passerines (songbirds), swallows, shorebirds, others[a]
Influenza A virus (e.g., H5N1)	Exposure to birds[k,l]	Raptors, others[a,l]
Enterococcus Infections (e.g., meningitis)	Contaminated water, exposure to birds[a]	Gulls[a]
Staphylococcus	Contaminated water[a]	Gulls, passerines (songbirds), raptors[a]
Listeria monocytogenes	Contaminated water[a]	Crows, gulls, others[a]
Enterobacteriaceae, *Yersinia* species	Various[a]	Crows, European starling, gulls, pigeons, others[a]
Campylobacter (*Campylobacter spp.*)	Contaminated water, food[e,m]	Crows, gulls, pigeons, others[a]
Helicobacter (various species)	Contaminated water, feces, various[n]	Gulls, passerines (songbirds), others[a]
Other gram negative bacilli (Pseudomonas, Aeromonas, etc.)	Various[o]	Gulls[a]
Anaplasmataceae *(Anaplasma*	Bite of an infected tick[a]	Passerines (songbirds) [a]
Q fever or Rickettsiaceae (*Coxiella burnetii*)	Inhalation, ingestion, bite of an infected arthropod[e]	Pigeons[a]
Cholera (*Vibrio cholerae*)	Contaminated water[p]	Cormorants, gulls, pelicans, wading birds, others[a,q]
Tick-borne Encephalitis	Bite of an infected tick[a]	Blackbirds[†], others[a]
Newcastle Disease Virus	Infected birds, contaminated materials[r]	Cormorants, gulls, pigeons, others[a,r]
Coccidia (Eimeria)	Ingestion[a]	Cranes, owls, pigeons, others[a]
Cryptosportidium	Ingestion, often of contaminated water[a]	Cranes, gulls, others[a]
Helminths parasites (e.g., swimmer's itch)	Swimming[a]	Gulls, passerines (songbirds)[a]
Sarcocystis	Contaminated water[a]	Cowbirds, wading birds, others[a]

[*]Host species listed here only include those animals addressed in this EA. Additional species addressed in this EA may also act as hosts.
[†]Blackbirds include European starlings, common grackles, red-winged blackbirds, brown headed cowbirds
[a]Tsiodras et al. 2008
[b]Smith et al. 2005

[c]Samadpour et al. 2002
[d]Ejidokun et al. 2005
[e]Conover and Vail 2015
[f]U.S. Environmental Protection Agency 2012
[g]Kapperud et al. 1998
[h]Thornley et al. 2003
[i]USGS 2018
[j]Thomas et al. 2007
[k]Gill et al. 2006
[l]U.S. Interagency Steering Committee for Surveillance for HPAI 2016
[m]Abulreesh et al 2006
[n]Waldenström et al 2003
[o]Levesque et al 2000
[p]CDC 2016a
[q]Ogg et al. 1989
[r]Thomas et al. 2007

Escherichia coli, commonly known as E. coli, is a bacterium associated with the fecal material of warm-blooded animals including birds. Human infection can occur through consumption of food or water contaminated with the bacterium, or through direct or indirect contact with fecal material (Ejidokun et al. 2006, Conover and Vail 2015). In 2002, two children became sick with E. coli after making indirect contact with their father's soiled work clothes or shoes contaminated with bird feces (Ejidokun et al. 2000). E. coli contamination of water is of particular concern because large number of people can be sickened when the water is used for drinking, recreation or irrigation (Dolejska et al. 2007). Araújo et al. (2014) found that gulls were the source of E. coil in water at recreational area used for swimming. Although no people were sickened in this case, outbreaks of E.coli that have resulted in sickening >30 people have been traced to birds at recreational areas used for swimming (Samadpour et al. 2002, Bruce et al. 2003, Conover and Vail 2015). Also, of concern, Dolejska et al. (2007) found that gulls had acquired antibiotic resistant E. coli from making contact with either human or domestic animal (e.g., cattle waste) products. This E. coli can then be transferred to humans (or back to humans) directly when gulls contaminate agricultural fields or surface water used for drinking, recreation or irrigation (Dolejska et al. 2007, Araújo et al. 2014). Additional species of birds such as European starlings have the ability to transfer E. coli from place to place (Williams et al. 2011).

The bacterium, Salmonella, infects humans when they consume food or water that is contaminated or when they eat or touch their mouths after contact with infected animals or people (Smith et al. 2005, CDC 2013, Conover and Vail 2015). Because the bacterium can live for months in the environment (e.g., contaminated water or soil, dried feces) infection after people touch contaminated objects is also possible (CDC 2013, Conover and Vail 2015). In 2005, 40 people in Minnesota contracted Salmonella after elementary school children dissected infected barred owl pellets (Smith et al. 2005). Children conducting the dissection as well as other students using the (unsanitized) table afterwards and household members of the children infected tested positive for the bacterium (Smith et al. 2005). Because the disease spreads, and rates of infection increase when birds congregate to roost or feed; locations near areas where people eat or prepare food are particularly vulnerable (Conover and Vail 2015). For example, approximately 160 people contracted Salmonella after house sparrows gained access to a kitchen (Gaffuri and Holmes 2012). Symptoms include fever, diarrhea, and abdominal cramps but severe cases can lead to hospitalization or complications (Reiter's syndrome) which can result in a chronic condition (Conover and Vail 2015). Although there were 1,193 cases of Salmonellosis reported in Virginia in 2016, only 194 of these cases were caused by *Enterica typhimurium*, the bacterium serotype or strain associated with birds (Conover and Vail 2015, VDH 2016).

Histoplasmosis is a disease caused by the inhalation of fungal spores which grow in soil enriched with bird feces (Conover and Vail 2015). These soils exist at locations where birds congregate to roost, breed or feed and infection occurs when soil or other materials are disturbed (e.g., digging in soil, cleaning buildings etc.) (Conover and Vail 2015, CDC 2018). In 2001, 355 students at an Indiana school were sickened with Histoplasmosis when the school's courtyard (the location of a bird roost) was rototilled during school hours (Chamany et al. 2004). In 1984 an outbreak in Dinwiddie, Virginia killed one 19 year old man and hospitalized other construction workers renovating a farmhouse (VDH 1984). A review of Histoplasmosis outbreaks from 1938 to 2013 found that outbreaks occurred at locations where rock pigeons, European starlings, grackles, gulls, and other species of birds congregated (Benedict and Mody 2016). Most humans infected do not exhibit symptoms, however, those that do have cold or flu like symptoms (Conover and Vail 2015). Severe, sometimes fatal, cases occur when the fungus spreads from the lungs to other organs and the central nervous system (Conover and Vail 2015). Those with compromised immune systems are particularly vulnerable. Approximately 500,000 people in the U.S. are infected with Histoplasmosis each year (Conover and Vail 2015).

West Nile Virus is the most common mosquito-borne virus in Virginia (VDH 2016). In most cases, humans become infected when they are bitten by an infectious mosquito that has previously fed on an infected bird (Conover and Vail 2015). Most infections cause mild symptoms but severe cases can cause encephalitis (i.e., inflammation of the brain) or meningitis (i.e., inflammation of the lining of the brain and spinal cord) which may lead to permanent neurological problems or death (VDH 2016). Forty-eight cases of West Nile Virus were reported in the Commonwealth in 2018 (VDH 2019).

Campylobacteriosis is a disease caused by bacterium in the genus *Campylobacter.* Most people acquire the disease from ingesting contaminated food or water although people can acquire the disease from contact with the fecal material of infected animals (VDH 2016, Conover and Vail 2015). Wild birds, including crows, gulls, pigeons and European starlings have been shown to spread the bacterium in their feces (Keller et al. 2011, Sanad et al. 2013, Keller and Shriver 2014, Conover and Vail 2015). French et al. (2009) found that feces of wild birds in playgrounds could contribute to the occurrence of Campylobacteriosis in preschool children. Symptoms range from mild (diarrhea, abdominal pain, fever, nausea) to severe (arthritis, convulsions, Guillain-Barré syndrome) and children are most likely to become infected (VDH 2016). In 2016, 1,580 cases of and three deaths from Campylobacteriosis were reported in the Commonwealth (VDH 2016).

This section includes only some examples of zoonotic diseases for which WS could provide surveillance or management assistance. It is not intended to be an exhaustive discussion of all potential zoonotic diseases for which WS could provide assistance.

Threat of Aircraft and Vehicles Striking Birds

Collisions between aircraft or vehicles and birds are a concern throughout the world because of the hazards they pose to human health and safety. Injury or death can occur when vehicles strike birds or when drivers or pilots try to avoid a collision with birds. From 1990 to 2018, civil aircraft strikes with those species addressed in this document were reported 73,651 times in the U.S. and 1,830 times in Virginia (Dolbeer et al. 2019, FAA 2019). However, the number of strikes occurring is likely to be much greater, since an estimated 80% of civil aviation wildlife strikes with wildlife go unreported (Cleary et al. 2000). These strikes to civil aircraft resulted in 10 fatalities and 86 injuries in the U.S. (Table 1.2). None of these incidents occurred in Virginia. Prior to the inception of the strike database in 1990, injuries and substantial loss of life did occur due to civil airstrikes involving species addressed in this document (Dolbeer 2013). For example, in 1960, 10 people were injured and 62 were killed when a commercial aircraft struck a flock of European starlings and crashed just after takeoff in Massachusetts (CAB 1962). Not tracked in publicly available databases, collisions between birds and military aircraft are also

dangerous to people (Pfeiffer et al. 2018). Fatalities between birds and military aircraft have been estimated at nine deaths per year (Conover 2019). Because many military aircraft allow pilots to eject, loss of life can be avoided (Christie 2013). However, not all aircraft types allow for ejection. For example in 2011, two Marines in California were killed when their helicopter struck a red-tailed hawk (Roth 2012).

Table 1.2 – Number of strikes to civil aircraft in the U.S. causing human fatality or injury and involving species addressed in this document (1990-2019)[a].

Species	Number of strikes	Number of people killed	Number of people injured
Red-tailed hawk	9	8	10
Brown pelican	1	1	0
Turkey vulture	19	1	22
Black vulture	9	0	14
Ring-billed gull	3	0	9
Double-crested cormorant	4	0	5
American kestrel	1	0	5
Anhinga	3	0	4
Osprey	3	0	3
Rock pigeon	3	0	3
Herring gull	3	0	3
American robin	1	0	1
Cattle egret	1	0	2
Horned lark	1	0	1
Mourning dove	1	0	1
Sandhill crane	1	0	1
Snowy egret	1	0	1
White ibis	1	0	1
Total	65	10	86

[a]FAA 2019

Additional Human Safety Concerns

Though birds rarely attack humans, attacks do occur, especially during the breeding season or alternatively when birds are building nests, incubating eggs or rearing chicks. Attacks may consist of dive-bombing (where birds fly very close to a person before veering away), impaling or pecking with beak, hitting with body, wings and or feet or even raking or grabbing with feet (Parker 1999). An estimated 1,594 people are injured annually in the U.S. when birds (both domestic and non-domestic birds) attack (O'Neil et al. 2007). It is unknown how many of these injuries involve birds addressed in this document. However, reports of injuries to humans from wild turkeys and species of raptors (e.g., hawks and owls) are not uncommon (Bungey 2011, Cudmore 2015, Pallone 2019). Injuries occur when the bird physically contacts a person or when a person is injured trying to defend themselves, someone else or a pet or attempting to flee. Injuries may be minor or in rare cases result in death (Parker 1999, Bungey 2011). Allowing birds to become accustomed to people increases the likelihood of an attack (Massachusetts Division of Fisheries and Wildlife 2016).

Additionally, birds can threaten human health and safety when the buildup of feces on walkways, and other foot traffic areas causes slipping hazards. Personal injury resulting from falls when people lose footing on bird droppings has been a cause for legal action (Swift 2008). To avoid those conditions,

regular cleanup is often required to alleviate threats of slipping on fecal matter, which can be economically burdensome.

Need for Bird Damage Management to Resolve Damage to Agricultural Resources

Requests received by WS for assistance in reducing or preventing damage or threats of damage from those species of birds addressed in this EA to agriculture falls into three categories: crops, livestock and other resources. Farming is an important industry in Virginia with approximately 7.7 million acres devoted to agricultural production in Virginia in 2017 (NASS 2019). In the same year, agricultural products sold in the Commonwealth had a market value estimated at $3.9 billion (NASS 2019).

Damage and Threats to Agricultural Crops

In 2017, crops sold in the Commonwealth had a market value estimated at $1.3 billion (NASS 2019). Sales of grains, oilseeds, dry beans and peas in 2017 totaled $510 million, while sales of vegetables, melons, potatoes and sweet potatoes totaled $111 million and the sale of fruits, tree nuts and berries totaled $76 million (NASS 2019). Many of these crops are vulnerable to bird damage.

Reports of wildlife damage to agricultural crops have increased over time (Conover and Decker 1991). In its most recent survey of agricultural losses to wildlife, conducted in 2002, the National Agricultural Statistics Service (NASS), reported that nationwide, field crop losses to wildlife totaled $619 million and losses of vegetables, fruits and nuts totaled $146 million (NASS 2002). Wildlife damage, including damage to crops associated with birds, is not evenly distributed among agricultural producers (Somers and Morris 2002, Shwiff et al. 2017).

Bird damage to agricultural crops occurs when birds directly consume plant parts, when birds damage plant parts, or when they contaminate stored crops, unharvested crops or fields with fecal material (Anderson et al. 2013, Linz et al. 2018). Different species of birds tend to select for different species of plants at different life stages (Linz et al. 2018). The greatest damage to crops often occurs where high densities of birds congregate during the non-breeding period (Linz et al. 2018). Although crop damage varies considerably, and variations in yield caused by factors besides bird damage make it difficult to provide precise estimates of yield loss, bird damage becomes economically significant if greater than 5% of a crop is lost (Shwiff et al. 2017). This magnitude of loss is not unusual. Anderson et al.'s (2013) survey of apple, blueberry, cherry and wine grape growers in five states found that 22.7% of growers reported a loss of greater than 10%.

Some examples of damage to agricultural crops by birds addressed in this document include but are not limited to the following examples:

Blackbirds, (i.e., red-winged blackbird, common grackle, boat-tailed grackle, brown-headed cowbird) cause damage to a variety of sprouting and ripening grain crops including corn, sunflower, sorghum, wheat, and rice (Dolbeer and Linz 2016, Shwiff et al. 2017). Additionally, grackles cause damage to fruit and melon crops (Dolbeer and Linz 2016, Shwiff et al. 2017). The cost of this damage is significant (Shwiff et al. 2017). For example, blackbirds were responsible for the annual loss of sunflowers (grown for oilseed and confectionery purposes) valued at $17.6 million dollars across eight states (USDA 2015).

American robins cause damage to a variety of fruits crops (e.g., apples, blueberries, cherries, etc.) when they consume or disfigure fruits or when they knock fruit to the ground (NASS 1999, Anderson et al. 2013). Fruit growers reported that American robins were responsible for the majority of the blueberries and cherries lost to birds in a survey of growers in five states (those surveyed lost >$55 million in blueberries and cherries to birds annually) (Anderson et al. 2013).

Both American crows and fish crows can cause damage to fruits, corn, grain and seed crops (Michigan State University 2019, Billerman et al. 2020). Crows will pull sprouting plants from the soil to consume the germinating seed (ODNR 2001, Michigan State University 2019). They also target corn, grain and seed at the ripening or mature stage (ODNR 2001). Damage to fruit occurs when it is consumed whole (berries, cherries), when it is knocked to the ground, or when flesh is pecked and slashed, reducing or eliminating its' marketability (Michigan State University 2019). Fruit growers reported that American crows were responsible for the majority of honeycrisp apples and a substantial proportion of the cherries lost to birds in five states (those surveyed lost >$29 million in honeycrisp apples annually) (Anderson et al. 2013).

European starlings cause damage to a diversity of crops including apples, blueberries, cherries, grapes, peaches, strawberries and sweet corn (Homan et al. 2017). Fruit is damaged when flesh is directly consumed and when flesh is pecked and slashed reducing or eliminating its' marketability and increasing the fruit's susceptibility to disease and other pests (Homan et al. 2017). Corn is damaged when birds pull back the husk and peck out the kernel (ODNR 2001). Fruit growers reported that European starlings were responsible for the majority of wine grapes and a substantial proportion of the blueberries, honeycrisp apples and cherries lost to birds in five states (those surveyed lost >$70 million in wine grapes annually) (Anderson et al. 2013).

Wild turkey can cause damage to corn, soybean, wheat and hay crops, but this damage is usually insignificant (ODNR 2001, Groepper et al. 2013). The majority of wild turkey damage is caused to specialty crops (e.g., ornamental plants, ginseng, wine grapes, apples, blueberries, other fruits) because the value of the crop is high; therefore, small amounts of damage leads to considerable financial loss (Groepper et al. 2013, Anderson et al. 2013).

Damage and Threats to Livestock

Predation

Bird predation damage to livestock resources occurs from the economic losses associated with birds killing or injuring cattle, sheep, goats, swine, poultry, fish, or other animals raised for commercial use. In Virginia in 2017, sales of livestock generated substantial income (poultry, $1.3 billion; cattle, $679 million; swine, $96 million; aquaculture, $90 million and sheep/goats, $13 million) (NASS 2019).

Some examples of predation damage to livestock inflicted by birds addressed in this document include but are not limited to the following examples:

Black vultures are predatory birds which kill or injure vulnerable livestock, especially newborns or mothers giving birth (Avery and Lowney 2016, Zimmerman et al. 2019). They target the eyes, naval, rectum, nose and other soft membranous tissues. These birds are opportunistic and highly social so the feeding behavior of one bird usually attracts many others which easily overwhelm the livestock. In the most recent livestock surveys available, an estimated 23 sheep and 265 lambs (valued at $43,889) as well as 122 cows and 608 calves (valued at $480,418) are lost to vulture predation in Virginia on an annual basis (NAHMS 2015, NAHMS 2017a). Additionally, using the most recent survey data, 31 kid goats are annually lost to "predatory birds" in Virginia (NAHMS 2017b). Most of this predation can be attributed to black vultures (C. Fox, USDA APHIS WS, personal communication, 2019). Livestock that are not killed are often euthanized due to the extent of their injuries. Although the number of livestock injured by individual predator species was not given, data from these same surveys indicate that the number injured by vultures is likely substantial (NAHMS 2015, NAHMS 2017a, NAHMS 2017b).

Hawks (e.g., Cooper's hawk, red-tailed hawk, osprey) and owls (e.g., great horned owl) also prey on livestock (Acorn and Dorrance 1990, Parkhurst et al. 1992, Hygnstrom and Craven 1994, Washburn 2016). Free-ranging birds (e.g., chickens, ducks, turkeys, guinea fowl, rock pigeons, game birds) and animals that are not confined in completely enclosed spaces (e.g., fish in aquaculture ponds without netting) are particularly vulnerable (Washburn 2016). However, confined animals may also be injured or killed when the predator is able to gain access, when they are attacked through fencing or netting or when they are crowded against each other after being driven into a confined space and suffocate (Acorn and Dorrance 1990, Washburn 2016).

Common ravens and crows will prey on young poultry, piglets, lambs, calves, fish and other livestock that are unable to escape or defend themselves (Parkhurst et al. 1992, Acorn and Dorrance 1990, O'Brien 2014). With larger prey, birds target the eyes, naval, rectum, nose and other soft tissue (Acorn and Dorrance 1990, O'Brien 2014). Livestock that are not killed are often euthanized due to the extent of their injuries. A study is currently attempting to determine the magnitude of raven predation on sheep and cattle (Brown 2019) which may be increasing (Doubet 2018).

Double-crested cormorants are predatory birds which consume a wide variety of fish and other aquatic organisms grown by the aquaculture industry (Billerman et al. 2020, Hudson and Murray 2015, NASS 2019). Predatory damage occurs not only from direct consumption but also from injury resulting from predatory attacks. Substantial effort has been focused on double-crested cormorant predation of commercially raised fish, which can be considerable (see Dorr and Engle 2015). The sale of aquatic organisms grown by the aquaculture industry (fish, crustaceans and mollusks) in Virginia during 2017 totaled $90 million (NASS 2019). The principal aquaculture products propagated in Virginia are catfish, trout, crustaceans, mollusks (primarily clams and oysters), and ornamental and sport/game fish (NASS 2019, Hudson and Murray 2015).

Wading birds (i.e., herons, egrets, ibis, etc.) cause damage to fish and other organisms grown by the aquaculture industry (Parkhurst et al. 1992, Dorr and Taylor 2003, Barras 2013). As many as 12 species of wading birds are reported as causing damage to aquaculture (Dorr and Taylor 2003). Glahn et al. (1999) estimated that 5 individual producers lost an average of 6,573 trout valued at $16,815 to great blue herons during the 168 day study period. Studies of wading bird impacts on other types of aquacultural production (e.g., baitfish, ornamental fish) yield similar results; wading birds can have a direct economic impact (Dorr and Taylor 2003).

Other species addressed in this assessment, (e.g., belted kingfisher, common grackle, grebes, gulls, terns, brown pelican, anhinga, others) can also cause predation damage at aquaculture facilities (Parkhurst et al. 1987, Parkhurst et al. 1992, Barras 2013). Parkhurst et al. (1992) found that common grackles captured and removed more fish per day than any other predator species observed at 10 Pennsylvania trout hatcheries. This resulted in an average loss of 145,035 fish (valued at $60,854) per hatchery per year (Parkhurst et al. 1992). In this same study, kingfishers were responsible for an average loss of 7,533 fish (valued at $3,568) per hatchery per year (Parkhurst et al. 1992).

Disease

Although the source of disease outbreaks can be difficult to identify, a risk of disease transmission exists wherever wild or free ranging birds and livestock interact or use the same resources such as water or food. Of the animal diseases that occur in the U.S., 72% (42) are presumed to require wildlife to transmit, maintain or complete the life cycle of the pathogen (Miller et al. 2013). Of these, six are so common in wildlife and their ability to infect domestic animals is so common that it impedes their eradication (Miller et al. 2013). The role wildlife plays in livestock diseases is expected to increase (Siembieda et al. 2011). Diseases which can be transmitted from wild or free ranging birds to livestock may be bacterial, spirochetal, rickettsial, viral, fungal, prions or parasites. Examples of diseases, the livestock they affect,

and the animal host are displayed in Table 1.3. The economic impact of these diseases is substantial and likely exceed $1 billion dollars on an annual basis (Linz et al. 2018). Livestock diseases cause loss through morbidity, mortality, decreased production, decreased feed efficiency, lower reproductive success, and the costs associated with veterinary diagnostics and treatment.

Wild birds are the acknowledged natural reservoirs for a variety of avian influenza viruses (Davidson 2006). Wild birds can carry both low pathogenic strains (Stallknecht 2003, Pedersen et al. 2010) and high pathogenic strains of avian influenza (Brown et al. 2006). While infected wild birds usually don't get sick, domestic poultry are highly susceptible to avian influenza, and can become sick or die (Nettles et al. 1985, Gauthier-Clerc et al. 2007, Pedersen et al. 2010, CDC 2017). Avian influenza viruses may be transferred from wild to domestic birds when birds make direct contact or contact surfaces or resources (water, food) that have been contaminated by the virus (CDC 2017). WS collected samples from wild birds, with a focus on highly pathogenic avian influenza. Avian influenza was identified in shorebirds during these sampling efforts in Virginia (10% of sampled dunlin tested positive for low pathogenic avian influenza) (T. Linder, USDA APHIS WS National Wildlife Disease Program, personal communication, 2020). The potential impacts from an outbreak of high pathogenic avian influenza (strains of the disease which are severe and cause high levels of mortality) in domestic poultry would be devastating, and possibly crippling to the multi-billion dollar industry through losses in trade, consumer confidence, and eradication efforts (Pedersen et al. 2010). In 2002, the commercial poultry industry in Virginia experienced losses of $130 million due to an outbreak of avian influenza, 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, personal communication, 2009). In 2015, 7.4 million turkeys and 43 million chickens either died of or were euthanized to contain an outbreak of high pathogenic avian influenza in 21 states (USDA 2016). To date, this is the most expensive animal health incident ever recorded in U.S. history with a cost of $3.3 billion (USDA 2016).

Newcastle disease is a contagious viral disease caused by avian paramyxovirus 1 (APMV-1) (Davidson 2006, Iowa State University 2016). While some birds can carry the virus and not become sick, domestic poultry, particularly chickens are highly susceptible (Alexander and Senne 2008, Iowa State University 2016). APMV-1 may be transferred from wild to domestic birds through inhalation or ingestion of resources contaminated by the virus (Iowa State University 2016). Severity of the infection depends on the species of bird and the strain of the virus but may result in anything from a mild respiratory infection to sudden death with no preceding clinical signs (Iowa State University 2016). Mortality rates can be as high as 100% among infected chickens (Iowa State University 2016); so, the economic impact is enormous (Alexander and Senne 2008).

Birds are carriers of a variety of other diseases and parasites that can impact livestock (see Table 1.3). Although difficult to document, wild birds at livestock facilities are strongly associated with the contamination of food and water sources. For example, Carlson et al. (2011a) found that reducing the number of European starlings eliminated Salmonella from feed bunks and substantially reduced the presence of Salmonella in water troughs. In the study, Salmonella contamination of both feed and water troughs was significantly related to the number of European starlings present. Salmonella may both be introduced to or transmitted between sites at livestock operations by wild birds (Pedersen and Clark 2007, Carlson et al. 2010b).

Table 1.3: Wildlife diseases with bird hosts that pose threats to livestock in the United States

Disease	Affected livestock	Hosts*
Avian chlamydiosis	Ducks, turkeys, chickens[a]	Blackbirds[†], egrets, gulls, herons, house sparrows, killdeer, pigeons, raptors, shorebirds[a]
Avian infectious bronchitis	Chickens[a]	Cormorants, gulls, pigeons, wading birds[b]
Avian influenza	Chickens, turkeys, ducks, geese, game birds[a]	Cormorants, gulls, rails, terns, wading birds[c]
Avian mycoplasmosis (*Mycroplasmosis gallisepticum*, others)	Chickens, turkeys, game birds, ducks, geese[a]	Bobwhite quail, doves, European starling, finches, northern mockingbird, pigeons, raptors, sparrows, wild turkey[a,d]
Equine encephalomyelitis (eastern and western)	Equids†, reports of cattle, sheep, camelids‡ and pigs[a]	American goldfinch, American robin, blue jay, common grackle, house finch, northern cardinal, pigeons, sparrows, wild turkey[e]
Fowl cholera	Poultry[a]	Crows, egrets, European starlings, gulls, grebes, herons, pigeons, raptors, ravens, sparrows, terns, wild turkey[f]
Infectious bursal disease	Chickens, turkeys, ducks, guinea fowl[a]	Sandhill crane, wild turkey[g]
Newcastle disease	Chickens, turkeys, game birds, ducks, geese, pigeons[a]	Double-crested cormorant[h], gulls and others[i]
Pullorum disease	Chickens, turkeys, pheasants, other poultry[a]	Gulls, pigeons[j]
Q fever	Cattle, sheep, goats[a]	American robins, blackbirds, crows, pigeons, sparrows[k]
West Nile virus	Equids†, geese[a]	Blue Jays, crows, others[e,l]
Trichomoniasis	Poultry, pigeons[a]	Mourning dove, pigeon, raptors[m]

*Host species listed here only include those animals addressed in this EA. Additional species addressed in this EA may also act as hosts.
†Equids include horses, donkeys, and mules
‡Camelids include llamas and alpacas
[a]Miller et al. 2013
[b]Jonassen et al. 2005, Muradrasoli et al. 2010
[c]Olsen et al 2006
[d]Luttrell and Fischer 2007
[e]McLean and Ubico 2007
[f]Samuel, Botzler and Wobeser 2007.
[g]Candelora et al. 2010
[h]Leighton and Heckert 2007
[i]Iowa State University 2016
jDaoust and Prescott 2007
[k]Conover and Vail 2015
[l]Daszak et al 2001
[m]Atkinson et al. 2008

Damage and Threats to Other Agricultural Resources

Birds cause damage to other agricultural resources besides crops and livestock. For instance, many species can cause damage when they consume, contaminate or destroy stored grain, feed or seed (ODNR 2001, Elser 2019). For example, vultures and crows will peck holes and tear away sections of plastic that encloses rolled bales of hay. This allows moisture and air into the bales which can cause deterioration or the introduction of fungus which can cause the hay to be unusable (ODNR 2001). Similarly, wild turkey will scratch at and pull out portions of rolled bales to get at seed (e.g., oats). This destabilizes the bale, making it hard to lift and transport (ODNR 2001).

Starlings and blackbirds can cause considerable economic losses when they consume or contaminate livestock feed (Shwiff et al. 2012, Medhanie et al. 2014, Elser et al. 2019). Livestock feed is formulated to ensure the proper nutrition required for livestock's maintenance, production, performance and reproduction. Often, the feed composed of non-homogeneous components (e.g., whole grains, pellets, etc.). The livestock are unable to individually select for these components but birds can and when large flocks of birds selectively feed on only some components (e.g., formulated energy nuggets) the composition of the feed can be altered, negatively affecting the health and production of livestock (Carlson et al. 2018*ab*). Shwiff et al. (2012) estimated that $10.6 million in economic damage occurred and 112 jobs were lost statewide in Pennsylvania in 2009 due to birds consuming or contaminating livestock feed at dairy farms. At cattle feed lots, Depenbusch et al. (2011) estimated that bird consumption of feed resulted in losses of $0.92 per animal per day

Need for Bird Damage Management to Resolve Damage to Natural Resources

Birds can negatively affect natural resources through habitat degradation, competition with other wildlife, direct depredation and other factors. Habitat degradation occurs when large concentrations of birds in a localized area negatively affect characteristics of the surrounding habitat, which can then adversely affect other wildlife species. Competition occurs when species compete for available resources, such as food or habitat. Direct depredation occurs when predatory bird species feed on other wildlife species, which can negatively influence those species' populations, especially when depredation occurs on threatened and endangered species. Examples of these types of damage and threats which occur or could occur in Virginia include but are not limited to the following examples:

Damage and Threats to Habitat

Bird damage to habitat occurs were birds congregate to nest or roost. Over time, the accumulation of fecal droppings, regurgitated food, food scraps, eggshells, carcasses and feathers at these locations can alter soil properties (Hayes and Caslick 1979, Rush et al. 2011, Ayers et al. 2015, Lafferty et al. 2016, Ilieva-Makulec et al. 2018, Veum et al. 2019). Changes in soil properties have implications for plant community dynamics, species composition and richness (Hicks 1979, Hebert et al. 2005, Lafferty et al. 2016, Veum et al. 2019) and over time birds can transform plant communities (Hicks 1979, Cuthbert et al. 2002, Boutin et al. 2011, Ayers et al. 2015, Lafferty et al. 2016, Veum et al. 2019). This can occur both indirectly (changes to soil properties) or directly (damage to plant parts from weight of nests, birds removing plant parts, bird feces damaging vegetation) (Weseloh and Ewins 1994, Koh et al. 2012). In some cases, impacts to vegetation are so severe on islands that all woody vegetation is eliminated (Cuthbert et al. 2002, Boutin et al. 2011). Veum et al. (2019) observed that changes to habitat persisted 10 years after a location had stopped being used by nesting double-crested cormorants. These changes can negatively impact birds (Jarvie et al. 1999, Shieldcastle and Martin 1999, Hebert et al. 2005, Veum et al. 2019) and other species of wildlife, including threatened and endangered species (Korfanty et al. 1999, Fedriani et al. 2017). Wires et al. (2001) identified vegetation die off as an important threat to 66% of colonial waterbird nesting sites designated as conservation sites of priority in the Great Lakes.

Damage and Threats Caused by Competition

Birds can negatively impact other species by competing for habitat (e.g., nesting locations). For example, non-native European starlings and house sparrows aggressively compete with native cavity nesting birds for nest locations (e.g., northern flicker, purple martins, sapsuckers (*Sphyrapicus spp*.) (European starlings); bluebirds, house finches and tree swallows (house sparrows)) (Gowaty 1984, Radunzelet et al. 1997, Koenig 2003, Fisher and Wiebe 2006, Cooper et al. 2007, Ghilain and Belisle 2008, Raleigh et al. 2019). These interactions may result in the loss of a nesting location, eggs, nestlings and/or adult birds (both European starlings and house sparrows will destroy the eggs and kill nestlings and adult birds) (Gowaty 1984, Billerman et al. 2020). Similarly, several species of colonial nesting waterbirds (double-crested cormorants, gulls) will aggressively compete and displace other bird species (USFWS 1996ab, Master 2001, USFWS 2003, Kress and Hall 2004, Gross and Haffner 2011, USFWS 2014a). For example, great black-backed gulls were responsible for driving common terns (*Sterna hirundo*) and other sensitive species from former nesting areas in the greater Chesapeake Bay (Brinker et al. 2007). Once gulls are removed from nesting areas historically occupied by nesting terns, terns returned often in the same year (Kress 1983, Blodget and Henze 1991, USFWS 2014a). Nesting common terns increased from just a few hundred pairs to more than 10,000 pairs in under a decade after gulls were removed and gull-free areas were identified and maintained (USFWS 2014a). This same effect has been observed elsewhere (Kress 1983, Guillemette and Brousseau 2011 see additional examples in Kress and Hall 2004). Gulls will also displace piping plovers (*Charadrius melodus*) or cause them to abandon breeding areas (Cross 1988 as cited in Boettcher et al. 2007) and plovers continue to either occur in low numbers or be completely absent from islands with established gull colonies in Virginia (Boettcher et al. 2007).

Unique in their breeding habits, brown-headed cowbirds lay their eggs in the nests of other bird species (Lowther 1993). All parental care is provided by the host species (Lowther 1993). Due to this, brown-headed cowbirds have substantial impacts on the reproductive success of other species (Lowther 1993) and can threaten the viability of a population or even the survival of a host species (Trial and Baptista 1993). Female cowbirds can lay up to 40 eggs per season with eggs reportedly being laid in the nests of over 220 species of birds (Lowther 1993).

Another way birds compete is for food. Laughing gulls actively steal fish from terns returning to nesting areas to feed chicks or their mates incubating the nest (Hatch 1970). In a series of studies conducted in the Gulf of Maine, laughing gulls were successful in stealing fish from terns between 32 and 57 percent of the time (USFWS 2014a). This behavior (kleptoparasitism) not only reduces the growth rate of tern chicks but also increases the energetic demands placed on adult birds which combined have the potential to reduce the overall nesting productivity of a nesting colony (USFWS 2008a).

Damage and Threats Caused by Predation

Virginia's coastal areas provide critically important habitat for nesting colonial waterbirds and shorebirds including the piping plover and roseate tern (*Sterna dougallii*), which are listed and protected under the Endangered Species Act (ESA) (Watts and Paxton 2014, Wilke et al. 2005). However, threats including habitat loss and degradation, sea level rise, severe weather events, human disturbance, competition with other species and predation jeopardize these populations (Davis et al. 2001, Erwin et al. 2011). Managing variables that are controllable (predator and competitor species, human disturbance) helps offset variables that are not within WS' control (weather, sea level rise). Predation continues to be a significant and manageable factor limiting recovery of many species of birds nesting on the barrier islands of Virginia.

The presence of even a single predator at a nest site can result in the direct mortality of adult birds, chicks and eggs or cause birds to abandon active nests and the nesting site entirely (Holt 1994, Shealer and Kress

1991, Kress and Hall 2004, Erwin et al. 2011). Even when direct mortality or nest abandonment does not occur, avian predators may cause reduced productivity when adult birds spend substantial time and energy mobbing predators and not incubating eggs, brooding chicks or foraging (Holt 1994). Gulls, crows, grackles and raptors are known or suspected to reduce breeding success of piping plovers (Boettcher et al. 2007, Daisey 2009, Smith et al. 2009, Wilke 2011, Wilke 2012), American oystercatchers (*Haematopus palliates*) (Daisey 2009, Denmon and Chapman 2012, Denmon and Tarwater 2011, Denmon et al. 2013, Nol 1989, Wilke et al. 2007, Wilke 2011), black skimmers (*Rynchops niger*) (Daisey 2009, O'Connell and Beck 2003), terns (*Sterna spp*.) (Daisey 2009, Erwin et al. 2011, O'Connell and Beck 2003) and other seabirds (Brinker et al. 2007, Wilke 2012) in Virginia. Predation is a primary threat facing the recovery of the piping plover and the American oystercatcher in Virginia (Boettcher et al. 2007, Wilke et al. 2007). Bird predation can be solely or primarily responsible for the failure (100% of nests lost) of a colony of nesting colonial waterbirds or localized population of shorebirds during a given year (Burger and Lesser 1979). There is a general inverse relationship between the number of predators removed and the productivity of beach nesting birds in any given year (USFWS 2014a). Management efforts in Virginia have been credited with reducing populations of predators that are reducing breeding success; and are believed responsible for increases in piping plover (Boettcher et al. 2007), American oystercatcher (Wilke 2011) and tern (Erwin et al. 2011) breeding success. Therefore, reducing predation is an important action identified for the recovery of species which are threatened, endangered or otherwise imperiled (USFWS 1996).

Threats Caused by Disease

Birds can negatively affect other wildlife through the transmission of disease. In situations where birds interact with other wildlife, the possibility of disease transfer exists. For example, Newcastle disease occurs commonly in double-crested cormorants (Leighton and Heckert 2007). Because the virus can survive in the environment for long periods, the transfer of disease at locations in which these birds interact with other species (e.g., colonial waterbird nesting locations) is a concern (Leighton and Heckert 2007). Examples of diseases which occur or could occur in Virginia and cause damage or threaten wildlife populations include but are not limited to some of the same diseases that threaten human and livestock health (see ***Damage and Threats to Livestock, Disease***).

Need for Bird Damage Management to Resolve Damage to Property

Birds can cause substantial damage to property. Examples of these types of damage and threats which occur or could occur include but are not limited to the following examples.

Damage Caused by Aircraft and Vehicles Striking Animals

Collisions between aircraft or vehicles and animals can result in significant damage. Birds of all sizes can be involved in collisions. Damage can occur when vehicles strike birds or when drivers or pilots try to avoid a collision with a bird or birds.

From 1990 to 2018, a total of 3,077 (4.2%) of the nationwide strikes with those species addressed in this EA were reported to have caused damage to the aircraft (Dolbeer et al. 2019). However, the number of strikes actually occurring is likely to be much greater, since many strikes go unreported and because only 56% of strike reports indicate species (Cleary et al. 2000, Dolbeer et al. 2019). These incidents can result in significant costs related not only to damage to the aircraft but also negative effects on flight. For example, strikes or near collisions can result in precautionary or emergency landings, evasive maneuvers, jettisoned fuel, and delayed or cancelled flights (Dolbeer et al. 2019). From 1990 to 2018, strikes with

those species addressed in the EA caused a reported $175 million dollars in economic losses[4] (Dolbeer et al. 2019). However, only 27% of damaging strikes reported cost, therefore the cost of strikes involving those species addressed in this EA is likely much greater (Dolbeer et al. 2019). From 1990 to 2018, strikes with all wildlife species resulted in a projected loss of $5.4 billion dollars (Dolbeer et al. 2019).

DeVault et al. (2016) found that cormorants, gulls and raptors (including vultures) along with ducks and geese were most likely to cause damage or substantial damage to aircraft when strikes occurred. In contrast to civil aircraft strikes, trends for military aircraft strikes have not been thoroughly investigated (Pfeiffer et al. 2018). The United States Department of the Air Force (USAF) reports that several species addressed in this EA are responsible for the costliest strikes (USAF 2020a). From 1995 to 2016, black vultures were involved in 414 strikes with USAF aircraft at a cost of $76 million dollars, which is more than any other species except Canada geese (USAF 2020ab). Turkey vultures were involved in 510 strikes at a cost of $38 million dollars, mourning doves were involved in 2,759 strikes at a cost of $29 million dollars and red-tailed hawks were involved in 568 strikes at a cost of $17 million dollars (USAF 2020ab). An investigation of strikes to USAF aircraft (1994–2017) and United States Department of the Navy (USN) aircraft (1990–2017) found that strikes with common loons resulted in damage 70% of the time (Pfeiffer et al. 2018). Other species which were associated with damage in more than 30% of strikes were: black vultures (58%), turkey vultures (48%), double-crested cormorants (44%), red-tailed hawks (37%), osprey (35%), herring gulls (32%), and great blue herons (31%) (Pfeiffer et al. 2018).

In Virginia from 1990 to 2019, 1,830 strikes with civil aircraft have been reported involving those species specifically addressed in the EA (FAA 2019). An additional 505 strikes were attributed to a group of birds (crows, gulls and vultures) and not a specific species. Because the EA addresses all the species found in those groups (e.g., crows = fish crows and American crows), they are included in this analysis (total of 2,335 strikes). Damage was reported in 202 of these strikes, involving a range of species (Table 1.4). In 47 or 23% of the 202 strikes the damage was substantial. Reported aircraft damage included broken windscreens, cracked and dented flaps, structural damage to wings, and a wide range of engine damage including engine failure. Reported negative effects on flight included precautionary landings, engine shutdowns, and aborted take offs all of which result in economic losses (FAA 2019).

Damage to military aircraft in Virginia is also of concern. For example, from 1995 to 2019, 455 strikes with USAF aircraft occurred in Virginia involving those species addressed in the EA (K. Russell, USAF, Safety Center, BASH Team, personal communication, 2020). Damage resulting from those strikes was valued at between $4.9 million to more than $12.2 million dollars[5]. In 2004, a strike in southwest Virginia involving a black vulture resulted in destruction of the aircraft (an F-15E) valued at more than $42 million dollars (USAF 2004, Sturgeon 2012). Additional costs, not included in these values, include those associated with reduction in military readiness. The most damaging strikes involving USAF flights during this time involved chimney swift, dunlin, willet, gulls, royal tern, vultures, osprey, Cooper's hawk, red-tailed hawk, barn swallow, eastern meadowlark, and common grackle. It is important to note that the USAF alters flight schedules to avoid periods of time when there is high bird activity (e.g., large flocks of birds present) (USAF 2018). Therefore, species involved in the most damaging strikes are likely somewhat a reflection of this policy. From 1995 through 2016, the USN recorded 340 strikes involving those species addressed in the EA in Virginia (D. Lynde Shultz, USDA WS, personal communication, 2020). Negative effects on flight included arrested landings, precautionary landings, aborted take offs, high speed abortions and changes in landing patterns. Strikes where birds are ingested into the engine(s) of an aircraft are often the costliest. During this period, engine damage was reported in strikes involving

[4] Should be considered a relative indices of losses not an actual estimated loss

[5]Damage costs are reported as being in a given bracket of values not as specific values. The bracket with the greatest values doesn't have a top value (i.e., >$2 million dollars).

chimney swift, black-crowned night-heron, osprey, cedar waxwing, eastern meadowlark and gulls. For example, at Naval Station Norfolk in 2019, a MH-60S rotocraft ingested a gray catbird (*Dumetella carolinensis*) into one of its engines destroying the engine valued at $128,396 dollars (J. Micalizzi, USDA WS, personal communication, 2020).

The infrequency of bird strikes does not lessen the need to prevent damage to aircraft. In addition, some species addressed in this EA pose minimal strike hazards at airports but their presence on airport property can attract other species which pose higher risks of aircraft strikes.

Table 1.4 – Number of strikes to civil aircraft in Virginia causing damage and involving species addressed in this document (1990–2019)[a]

Species	Number of damaging strikes
Gulls (species not reported)	73
ring-billed gull	26
European starling	13
turkey vulture	10
mourning dove	9
osprey	9
red-tailed hawk	7
great blue heron	7
rock pigeon	5
killdeer	5
vultures (species not reported)	4
black vulture	4
American robin	3
double-crested cormorant	3
laughing gull	3
American crow	2
Bonaparte's gull	2
common loon	2
great horned owl	2
wild turkey	2
barn swallow	1
broad-winged hawk	1
brown pelican	1
cedar waxwing	1
Cooper's hawk	1
eastern screech-owl	1
herring gull	1
horned grebe	1
northern flicker	1
purple martin	1
sandhill crane	1
	202

[a]FAA 2019

Like strikes between birds and aircraft, strikes between vehicles and birds are often unreported (Loss et al. 2014). Loss et al. (2014) estimated that between 89 and 340 million birds die annually in vehicle collisions in the United States. The possibility exists for any collision with a bird or any evasive action taken by a driver to avoid a collision to result in a collision with something else (e.g., another vehicle, a tree). Costs associated with bird-vehicle collisions include vehicle repair costs, towing, accident attendance and investigation (Johnson 2018, Massachusetts State Police 2018).

Damage and Threats to Pets

Damage to property also includes attacks on cats, dogs and other pets. For example, raptors and vultures will attack cats and dogs (Lowney 1999, Washburn 2016). If people or their pets approach areas where birds' nests, or young occur, or if alternatively, the birds perceive the pet as food, attacks may occur. Additionally, birds can transmit diseases to pets. For example, dogs, may become infected with avian influenza (Songserm et al. 2006, Song et al. 2008). Diseases and parasites affecting pets are many of the same diseases that can infect livestock (***Damage and Threats to Livestock****, Disease*) and humans (***Threat of Disease Transmission***).

Damage to Infrastructure and Other Property

Those species addressed in this EA can cause damage to many different types of infrastructure and property. Although damage can occur throughout the year, it is greatest during periods when birds are concentrated into large flocks. Examples include but are not limited to the following:

Birds have the ability to cause substantial property damage when they attack reflective surfaces (e.g., wild turkeys attacking cars Miller et al. 2000), excavate holes (e.g., woodpeckers creating holes to extract insects from wood siding (Harding et al. 2007), or cause other structural damage by pecking, tearing or pulling (e.g., black vultures ripping roof shingles and windshield wipers, Zimmerman et al. 2019). Property damage associated with birds also involves the accumulation of fecal matter, feather debris, nesting material or unconsumed or regurgitated food. Accumulations often occur in areas where birds feed, nest or roost. Fecal matter may kill vegetation; soil vehicles, facades, monuments, sidewalks and other hard surfaces; corrode metals (including support structures of buildings and bridges); deteriorate stone; and damage equipment (Belant 1997, Bernardi et al. 2009, Linz et al. 2018, Wu 2020). Feather debris and nesting material may clog filters, pumps and intakes (of exhaust vents), drains (on flat roofs), impact the efficacy of aids to navigation (e.g., channel markers), cause structural damage, fires, power-outages, or interruptions in service (i.e., from communications towers) (Belant 1997, Reed et al. 2014, Washburn 2014, Linz et al. 2018). Accumulations of unconsumed or regurgitated food in these locations may soil surfaces, clog drains or act as an attractant for insects or other wildlife. Additionally, damage occurs when birds transport food from one area to another to feed and leave unconsumed food or its housing behind (e.g., mollusk shells, garbage from landfills or dumpsters) (Burger 1981). Damage costs associated with unacceptable accumulations of feces, feather debris, nesting material or regurgitated food include; labor and materials to clean and sanitize, loss of property use, loss of aesthetic value, loss of customers or visitors (and associated income), and costs associated with the implementation of damage management methods.

NATIONAL ENVIRONMENTAL POLICY ACT (NEPA) AND WS DECISION-MAKING:

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

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

1.4 DECISIONS TO BE MADE

Based on agency relationships, MOUs, and legislative authorities, WS is the lead agency for this EA, and therefore, responsible for the scope, content, and decisions made. Management of migratory birds is the responsibility of the USFWS, while the Virginia Department of Wildlife Resources (VDWR) manages resident bird populations. Therefore, the lethal removal of birds by WS to alleviate damage or reduce threats of damage as described in this EA could only occur within the parameters established by the USFWS and/or the VDWR. The VDWR establishes and enforces regulated hunting seasons under frameworks determined by the USFWS, including the establishment of seasons that allow the take of some of the bird species addressed in this assessment. Cooperation between USFWS and/or the VDWR and WS ensures WS' actions are incorporated into population objectives.

Based on the scope of this EA, the decisions to be made are:

How can WS best respond to the need to address damage caused by birds in Virginia?

Do the alternatives have significant impacts meriting an Environmental Impact Statement (EIS)?

1.5 SCOPE OF THIS ENVIRONMENTAL ASSESSMENT

Affected Environment

Birds can be found across the Commonwealth throughout the year. Therefore, damage or threats of damage associated with birds could occur wherever birds occur as would requests for assistance to manage damage or threats of damage. Assistance would only be provided by WS when requested by a landowner or manager and WS would only provide direct operational assistance on properties where a MOU, Cooperative Service Agreement (CSA), or other comparable document had been signed between WS and the cooperating entity.

Upon receiving a request for assistance, the proposed action alternative, or those actions described in the other alternatives could be conducted on private, federal, Commonwealth, tribal, and municipal lands in Virginia to reduce damage and threats associated with birds. The analyses in this EA are intended to apply to actions taken under the selected alternative that could occur in any locale and at any time within the analysis area. This EA analyzes the potential impacts of bird damage management and addresses activities in Virginia that are currently being conducted under a MOU, CSA, or other comparable document with WS. This EA also addresses the potential impacts of bird damage management in the Commonwealth where additional agreements may be signed in the future.

Federal, Commonwealth, County, City, and Private Lands

Under two of the alternatives analyzed in detail, WS could continue to provide assistance on federal, state, county, municipal, and private land when a request was received for such services from the

appropriate resource owner or manager. Actions taken on federal lands have been analyzed in the scope of this EA.

Native American Lands

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

Site Specificity

This EA analyzes the potential impacts of alternative approaches to managing damage and threats associated with birds that could be conducted on private and public lands in Virginia where WS and the appropriate entities have entered into an agreement through the signing of a MOU, CSA, or other comparable document. WS would only conduct damage management activities when requested by the appropriate resource owner or manager. This EA also addresses the potential impacts of conducting damage management activities in areas where additional MOUs, CSAs or other comparable documents may be signed in the future. Because the need for action is to reduce damage and because the goals and directives of WS are to provide services when requested, within the constraints of available funding and workforce, it is conceivable that additional efforts could occur. Thus, this EA anticipates those additional efforts and analyzes the impacts of such efforts as part of the alternatives.

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

Chapter 2 of this EA identifies and discusses issues relating to the management of damage and threats associated with birds in Virginia. The standard WS Decision Model (Slate et al. 1992) would be the site-specific procedure for individual actions conducted by WS (see Chapter 2 for a description of the Decision Model and its application). Decisions made using the model would occur in accordance with

WS' directives and Standard Operating Procedures (SOPs) as described in Chapter 2 of this EA, as well as relevant laws and regulations.

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

1.6 AUTHORITY OF FEDERAL AND STATE AGENCIES

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

Wildlife Services (WS):

The primary statutory authorities for the WS program are the Act of March 2, 1931 (7 USC 8351-8352) as amended, and the Act of December 22, 1987 (7 USC 8353). The WS program is the lead federal authority in managing damage to agricultural resources, natural resources, property, and threats to human safety associated with wildlife. WS' directives define program objectives and guide WS' activities managing animal damage and threats.

United States Fish and Wildlife Service (USFWS):

The USFWS is the primary federal agency responsible for conserving, protecting, and enhancing the nation's fish and wildlife resources and their habitat. The USFWS has specific responsibilities for the protection of migratory birds, threatened and endangered species, inter-jurisdictional fish, and certain marine mammals, as well as for lands and waters managed by the agency in the National Wildlife Refuge System. The USFWS has statutory authority for enforcing the Fish and Wildlife Improvement Act of 1978 (16 USC 7.12), the Fish and Wildlife Act of 1956 (16 USC 742 a-j), the Migratory Bird Treaty Act (16 USC 703-711), and the Bald and Golden Eagle Protection Act (16 USC 668-668c).

United States Environmental Protection Agency (EPA):

The U.S. Environmental Protection Agency (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 and pesticides available for use to manage damage associated with animals.

United States Food and Drug Administration (FDA):

The U.S. Food and Drug Administration (FDA) is responsible for protecting the public health by assuring the safety, efficacy, and security of human and veterinary drugs, biological products, medical devices, our nation's food supply, cosmetics, and products that emit radiation. The FDA is also responsible for advancing the public health by helping to speed innovations that make medicines and foods more effective, safer, and more affordable; and helping the public get the accurate, science-based information they need to use medicines and foods to improve their health.

Virginia Department of Wildlife Resources (VDWR):

The VDWR, 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 (§ 29.1-103), public education charges (§ 29.1-109), law enforcement authorities (§ 29.1-109), and regulatory powers (§29.1-501). The mission of the VDWR is:

Conserve and manage wildlife populations and habitat for the benefit of present and future generations.
Connect people to Virginia's outdoors through boating, education, fishing, hunting, trapping, wildlife viewing, and other wildlife-related activities.
Protect people and property by promoting safe outdoor experiences and managing human-wildlife conflicts.

The VDWR is responsible for classifying animals as nuisance species. It is responsible for establishing and enforcing hunting seasons for migratory game birds listed under the MBTA under frameworks developed by the USFWS (Title 29.1, Chapter 5, Section 515). Additionally, the Board of Directors is responsible for the classification and protection of endangered and threatened species.

VDWR has a MOU with WS to facilitate the planning, coordination, and implementation of policies developed (1) to prevent or minimize damage caused by wildlife to public and private resources, including threatened and endangered species, agriculture, property, and natural resources; (2) to address public health and safety issues associated with wildlife damage and wildlife diseases; (3) to facilitate a regular exchange of information; and (4) to provide a framework for procedures and authorizations required to conduct wildlife damage management activities in the Commonwealth of Virginia.

Virginia Department of Agriculture and Consumer Services (VDACS):

Under § 3.2-102 of the Code of Virginia, the Commissioner of Agriculture and Consumer Services is charged with regulating pesticides. The VDACS has the authority to classify restricted pesticides; certify and register pesticide applicators; license pesticide dealers, businesses and consultants; and conduct investigations and enforce these measures. Chapter 39 under Title 3.2 of the Code of Virginia is known as the Virginia Pesticide Control Act. 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 (§ 3.2-901).

VDACS 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.

Virginia Department of Environmental Quality (VDEQ):

The Virginia Department of Environmental Quality (VDEQ) is the Commonwealth's primary environmental regulatory agency.

1.7 DOCUMENTS RELATED TO THIS ENVIRONMENTAL ASSESSMENT

WS' Environmental Assessments Re-Evaluated Under this EA:

WS previously developed an EA in cooperation with the USFWS that identified the need to manage damage associated with birds (USDA 2014). This EA identified the issues associated with managing bird damage in the Commonwealth and analyzed alternative approaches to meet the specific need identified while addressing the identified issues. Changes in the need for action, primarily a need to address damage and threats of damage associated with additional species of birds, and changes in the affected

environment, have prompted WS and the USFWS to initiate a new analysis. 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 will be superseded by this analysis and the outcome of the Decision issued, based on the analyses in this EA.

U.S. Shorebird Conservation Plan:

Drafted in 2000, the United States Shorebird Conservation Plan is a plan for stabilizing and maintaining populations of shorebird species (Brown et al. 2001). Population information for the species included in the plan were obtained from a variety of sources and assembled to avoid overlap or duplication. Since detectability and "countability" varies by species and habitat and because geographic coverage of survey information is often incomplete, the maximum number of birds observed across all seasons was used as the basis for population estimates generated for the plan (Brown et al. 2001).

North American Waterbird Conservation Plan:

The Waterbird Conservation Plan, published in 2002, provides a continental scale framework for conserving and managing 210 species of waterbirds (Kushlan et al. 2002). The continental plan provides for regional plans on smaller more practical scales that take into consideration both political and ecological factors. Regional plans which are relevant to this EA are the Mid-Atlantic / New England / Maritimes Region Plan (MANEM 2006), the Southeast Region Plan (Hunter et al. 2006) and the Upper Mississippi Valley / Great Lakes Waterbird Conservation Plan (Wires et al. 2010). See Appendix C for a detailed description of Bird Conservation Regions (BCR) which regional plans (and population information) is based upon.

USFWS Environmental Impact Statement for Issuing Depredation Permits for Double-crested Cormorant Management

The USFWS announced on December 29, 2020 a Record of Decision for the EIS: Management of Conflicts Associated With Double-Crested Cormorants Throughout the United States. The USFWS selected Alternative A that creates a special state/tribal permit that allows states and tribes to manage cormorant damage to their respective resources. The USFWS will continue to issue standard depredation permits to protect other resources, such as commercial aquaculture. The maximum allowable take will be 121,504 double-crested cormorants nationally per year under the selected alternative. The Atlantic subpopulation maximum allowable take level will be 37,019 double-crested cormorants. The final rule took effect on February 12, 2021. This document is an independent analysis examining potential impacts of the alternatives on double-crested cormorants.

Birds of Conservation Concern:

The 1988 amendment to the Fish and Wildlife Conservation Act mandates the USFWS, "identify species, subspecies, and populations of all migratory nongame birds that, without additional conservation actions, are likely to become candidates for listing under the Endangered Species Act (ESA) of 1973." Birds of Conservation Concern 2008 is the most recent effort to carry out this mandate (USFWS 2017*a*) (Appendix D).

Proposal to Permit Take as provided under the Final Programmatic Environmental Impact Statement for the Eagle Rule Revision:

Developed by the USFWS, this EIS evaluated the issues and alternatives associated with the promulgation of new regulations to authorize the "*take*" of bald eagles and golden eagles as defined under

the Bald and Golden Eagle Protection Act. The preferred alternative in the EIS evaluated the management on an eagle management unit level (similar to the migratory bird flyways) to establish limits on the amount of eagle take that the USFWS could authorize in order to maintain stable or increasing populations. This alternative further establishes a maximum duration for permits of 30 years with evaluations in five year increments (USFWS 2016*a*). A Record of Decision was made for the preferred alternative in the EIS. The selected alternative revised the permit regulations for the "*take*" of eagles (see 50 CFR 22.26 as amended) and a provision to authorize the removal of eagle nests (see 50 CFR 22.27 as amended). The USFWS published a Final Rule on December 16, 2016 (81 FR 91551-91553).

1.8 PUBLIC INVOLVEMENT

Issues related to the management of damage and threats associated with birds and the alternatives to address those issues were initially developed by WS. Issues were defined and preliminary alternatives were identified through the scoping process. As part of this process, and as required by the Council on Environmental Quality (CEQ) and APHIS' NEPA implementing regulations, this document will be noticed to the public for review and comment. This EA will be noticed to the public through legal notices published in local print media, through the APHIS stakeholder registry, and by posting the EA on the APHIS website at http://www.aphis.usda.gov/wildlifedamage/nepa.

WS will make the EA available for a minimum of 30 days comment period for the public and interested parties to provide new issues, concerns, and/or alternatives. Through the public involvement process, WS will clearly communicate to the public and interested parties the analyses of potential environmental impacts on the quality of the human environment. New issues or alternatives 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 Decision.

1.9 RATIONALE FOR PREPARING AN ENVIRONMENTAL ASSESSMENT RATHER THAN AN ENVIRONMENTAL IMPACT STATEMENT

WS has the discretion to determine the geographic scope of their analyses under the NEPA. 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 (FONSI). In terms of considering cumulative effects, one EA analyzing impacts for the entire state will provide a more comprehensive and less redundant analysis than multiple EAs covering smaller areas. If a determination is made through this EA that the proposed action or the other alternatives might have a significant impact on the quality of the human environment, then an EIS would be prepared.

1.10 ENVIRONMENTAL STATUS QUO

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

Most wildlife species are protected under Commonwealth and / or federal law. To address damage associated with these species, a permit must be obtained from the appropriate entity. However, in some

situations, species can be managed without the need for a permit. Rock pigeons, Eurasian collared-doves, monk parakeets, European starlings, house sparrows, as well as free ranging domestic and feral chickens, guinea fowl or peafowl, and the nests and eggs of these birds are not protected and may be lethally removed at any time. American crows, fish crows, red-winged blackbirds, common grackles, and brown-headed cowbirds, although protected under the Migratory Bird Treaty Act, may be removed or destroyed without a depredation permit from the USFWS at any time under a depredation order (50 CFR 21.43). Method restrictions apply in all instances (e.g., firearms restrictions, trapping restrictions, pesticide regulations).

When a non-federal entity (e.g., agricultural producers, individuals, or any other non-federal entity) takes an action involving birds, the action is not subject to compliance with the NEPA due to the lack of federal involvement[6] in the action. Under such circumstances, the environmental baseline or status quo must be viewed as an environment that includes those resources as they are managed or impacted by non-federal entities in the absence of the federal action being proposed.

Therefore, in those situations in which a non-federal entity has decided that a management action directed towards birds should occur and even the particular methods that should be used, WS' involvement in the action would not affect the environmental status quo because the entity could take the action in the absence of WS' involvement. WS' involvement would not change the environmental status quo if the requestor had conducted the action in the absence of WS' involvement in the action.

1.11 LAWS AND STATUES RELATED TO THIS DOCUMENT

Several laws or statutes authorize, regulate, or otherwise would affect WS' activities. WS complies with all applicable federal, Commonwealth, and local laws and regulations in accordance with WS Directive 2.210. Those laws and regulations relevant to managing damage in the Commonwealth are addressed below:

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

The Migratory Bird Treaty Act (MBTA) makes it unlawful, "to pursue, hunt, take, capture, kill, attempt to take, capture, or kill, possess, offer for sale, sell, offer to barter, barter, offer to purchase, purchase" some migratory bird species, or their parts, or active nests (16 USC 703-711). Active nests (nests with eggs or chicks present) are protected under the MBTA. Inactive nests (nests without eggs or chicks present) may not be collected or possessed but are not protected from destruction (USFWS 2018a;b). However, some inactive nests are legally protected by statutes other than the MBTA (e.g., Endangered Species Act, Bald and Golden Eagle Protection Act). A list of bird species protected under the MBTA can be found in 50 CFR 10.13. Bobwhite quail, wild turkey, rock pigeons, Eurasian collared-doves, monk parakeets, European starlings, house sparrows, as well as free ranging domestic and feral chickens, guinea fowl or peafowl, addressed in this EA are not protected under the MBTA (70 FR 12710-12716). The MBTA provides the USFWS with statutory authority for enforcing the MBTA. Under this authority, the USFWS may issue depredation orders or depredation permits to resolve damage caused by bird species protected under the Act (50 CFR 13 and 50 CFR 21). Additionally, the act grants the USFWS the authority to establish hunting seasons for migratory game birds (50 CFR 20). All actions conducted in this EA comply with the regulations of the MBTA, as amended.

Depredation Order for Blackbirds, Cowbirds, Grackles, Crows, and Magpies (50 CFR 21.43)
Pursuant to the MBTA under 50 CFR 21.43, a depredation permit is not required to lethally take

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

blackbirds, cowbirds, grackles, crows, and magpies when individuals of those species are, "found committing or about to commit depredations upon ornamental or shade trees, agricultural crops, livestock, or wildlife, or when concentrated in such numbers and manner as to constitute a health hazard or other nuisance." Those bird species addressed in this EA that can be lethally taken under this depredation order include American crows, fish crows, red-winged blackbirds, common grackles, and brown-headed cowbirds. As of 2010, rusty blackbirds cannot be lethally taken under this order (Sobeck 2010).

Bald and Golden Eagle Protection Act (16 USC 668-668c), as amended:

Populations of bald eagles showed periods of steep declines in the lower United States during the early 1900s attributed to the loss of nesting habitat, hunting, poisoning, and pesticide contamination. To curtail declining trends in bald eagles, Congress passed the Bald Eagle Protection Act (16 USC 668) in 1940 prohibiting the take or possession of bald eagles or their parts. The Bald Eagle Protection Act was amended in 1962 to include the golden eagle and is now referred to as the Bald and Golden Eagle Protection Act. Certain populations of bald eagles were listed as "endangered" under the Endangered Species Preservation Act of 1966, which was extended when the modern Endangered Species Act (ESA) was passed in 1973. The "endangered" status was extended to all populations of bald eagles in the lower 48 states, except populations of bald eagles in Minnesota, Wisconsin, Michigan, Washington, and Oregon, which were listed as "threatened" in 1978. As recovery goals for bald eagle populations began to be reached in 1995, all populations of eagles in the lower 48 States were reclassified as "threatened". In 1999, the recovery goals for populations of eagles had been reached or exceeded and the bald eagle was proposed for removal from the ESA. The bald eagle was officially de-listed from the ESA on June 28, 2007, except for the Sonora Desert bald eagle population (later delisted in 2011 [76 FR 54711, Sept. 2, 2011]). Although officially removed from the protection of the ESA, the bald eagle is still afforded protection under the Bald and Golden Eagle Protection Act.

This statute prohibits taking of eagles without a permit from the USFWS. Under the Bald and Golden Eagle Protection Act, "take" includes actions that "*pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, destroy, molest, or disturb*" eagles. The Bald and Golden Eagle Protection Act's implementing regulations at 50 CFR 22.3 further define disturb as:

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

Per statute (16 U.S.C. 668a) and regulation (50 CFR 22),the USFWS can issue permits for the take of bald eagles and golden eagles (see 81 FR 91551-91553, 50 CFR 22.23, 50 CFR 22.26, 50 CFR 22.27) provided authorizations are compatible with the preservation of both species. As necessary, WS would apply for the appropriate permits as required by the Bald and Golden Eagle Protection Act.

Endangered Species Act (ESA) (16 USC 1531-1544):

The Endangered Species Act (ESA) recognizes that our natural heritage is of *"esthetic, ecological, educational, recreational, and scientific value to our Nation and its people*." The purpose of the Act is to protect and recover species that are in danger of becoming extinct. It is administered by the USFWS and the Department of National Marine Fisheries Service (NMFS). The USFWS has primary responsibility for terrestrial and freshwater species while the NMFS is primarily responsible for marine organisms. Under the ESA, species may be listed as endangered or threatened. Endangered is defined as a species that is in danger of becoming extinct throughout all or a significant portion of its range while threatened is

defined as a species likely to become endangered in the foreseeable future. Under the ESA, *"all federal departments and agencies shall seek to conserve endangered and threatened species and shall utilize their authorities in furtherance of the purposes of the Act"* (Sec.2(c)). Additionally, the Act requires that, *"each Federal agency shall in consultation with and with the assistance of the Secretary, insure 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 or result in the destruction or adverse modification of habitat of such species……each agency will use the best scientific and commercial data available"* (Sec.7 (a) (2)). WS consults with the USFWS or the NMFS to ensure that the agencies actions, including the actions proposed in this EA, are not likely to jeopardize the existence of endangered or threatened species or their habitat.

National Historic Preservation Act (NHPA) (54 USC 300101 et seq.), as amended:

Section 106 of the National Historic Preservation Act (NHPA) requires federal agencies to take into account the effects of their undertakings on historic properties and afford the Advisory Council on Historic Preservation an opportunity to comment on such undertakings if an agency determines that the agency's actions are "*undertakings*". Undertakings are defined in Sec. 800.16(y) as a *"project, activity, or program funded in whole or part under the direct or indirect jurisdiction of a federal agency, including those carried out by or on behalf of a federal agency; those carried out with federal financial assistance; and those requiring a federal permit, license or approval"*. If the undertaking is a type of activity that does not have the potential to cause effects on historic properties, assuming such historic properties were present, the agency official has no further obligations under Section 106. None of the methods described in this EA that would be available for use under the alternatives cause major ground disturbance, any physical destruction or damage to property, any alterations of property, wildlife habitat, or landscapes, nor involves the sale, lease, or transfer of ownership of any property. In general, such methods also do not have the potential to introduce visual, atmospheric, or audible elements to areas in which they were used that could result in effects on the character or use of historic properties. Therefore, the methods that could be used by WS under the relevant alternatives are not generally the types of activities that would have the potential to affect historic properties. If an individual activity with the potential to affect historic resources were planned under an alternative selected because of a decision on this EA, the site-specific consultation as required by Section 106 of the NHPA would be conducted, as necessary.

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

Federal Actions to Address Environmental Justice in Minority Populations 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 minorities and low-income persons or populations. APHIS implements Executive Order 12898 principally through its compliance with the NEPA. All WS' activities are evaluated for their impact on the human environment and compliance with Executive Order 12898. WS would only use or recommend legal, effective, and environmentally safe methods, tools, and approaches. It is not anticipated that the proposed action would result in any adverse or disproportionate environmental impacts to minorities and persons or populations of low income.

Protection of Children from Environmental Health Risks and Safety Risks - Executive Order 13045:

Children may suffer disproportionately from environmental health and safety risks because their physical and mental systems are still developing. Each federal agency must therefore, *"make it a high priority to identify and assess environmental health and safety risks that may disproportionately affect children"* and *"ensure that its policies, programs, activities and standards address disproportionate risks to children"*. WS would only employ and/or recommend legally available and approved methods under the alternatives where it is highly unlikely that children would be adversely affected. For these reasons, WS concludes that it would not create an environmental health or safety risk to children from implementing this proposed action.

Invasive Species - Executive Order 13112:

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

Consultation and Coordination with Indian Tribal Governments - Executive Order 13175:

Executive Order 13175 directs federal agencies to establish regular and meaningful consultation and collaboration with tribal officials in the development of federal policies that have tribal implications, to strengthen the United States government-to-government relationships with Indian tribes and to reduce the imposition of unfunded mandates upon Indian tribes. Agencies shall respect Indian tribal self-government and sovereignty, honor tribal treaty and other rights and strive to meet the responsibilities that arise from the unique legal relationship between the federal government and Indian tribal governments. This Executive Order directs agencies to provide federally recognized tribes the opportunity for government-to-government consultation and coordination in policy development and program activities that may have direct and substantial effects on their tribe. Its purpose is to ensure that tribal perspectives on the social, cultural, economic and ecological aspects of agriculture, as well as tribal food and natural-resource priorities and goals, are heard and fully considered in the decision-making processes of all parts of the federal government. APHIS Directive 1040.3, Consultation with Elected Leaders of Federally Recognized Indian Tribes, provides guidance to APHIS programs on implementation of Executive Order 13175. In accordance with the provisions of Executive Order 13175 and APHIS Directive 1040.3, WS has invited all federally recognized tribes in Virginia to participate as cooperating agencies in the creation of the EA and offered to consult with them on the current and proposed bird damage management activities.

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 Memorandum of Understanding (MOU) with the USFWS that shall promote the conservation of migratory bird populations"*.

The Native American Graves Protection and Repatriation Act (NAGPRA) (25 USC 3001 et seq.):

The Native American Graves Protection and Repatriation Act (NAGPRA) establishes procedures for federal agencies when Native American "*cultural items*" are inadvertently discovered on federal or tribal lands. Cultural items may include human remains, funerary objects, sacred objects, and objects of cultural patrimony. In part, the NAGPRA requires federal agencies making such discoveries to notify the Secretary of the Department that manages the federal lands or the tribal leaders on tribal lands on which the discovery was made. Additionally, once a discovery is made, work must be stopped, and reasonable efforts must be made to protect the item.

Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) (7 USC 136 et seq.):

The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) requires the registration, classification, and regulation of all pesticides used in the United States. The EPA is responsible for implementing and enforcing the FIFRA. All chemical methods described in Appendix E, are registered with and regulated by the EPA and used or recommended by WS in compliance with labeling procedures and requirements.

Coastal Zone Management Act of 1972, as amended (16 USC 1451-1464, Chapter 33):

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

Protection of Wetlands – Executive Order 11990:

Executive Order 11990 was signed to "*minimize the destruction, loss or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands*". To meet those objectives, Executive Order 11990 requires federal agencies to consider alternatives to wetland sites, in planning their actions, and to limit potential damage, if a federal agency cannot avoid an activity affecting a wetland.

Nuisance Birds (Code of Virginia § 3.2-900 and 901):

This section of the Code states that, *"the Commissioner* [of Agriculture and Consumer Services] *shall conduct investigations and surveys to determine economic losses or public nuisances caused by nuisance birds and may develop a plan of action when he has determined that they are causing or about to cause economic losses in the Commonwealth, are detrimental to the public health and welfare, or otherwise create a public nuisance".* It also states that the Commissioner may, *"provide technical assistance to persons for the suppression of nuisance birds", "appoint an advisory committee to evaluate facts in any particular situation and to make recommendations to him on the course of action", "upon receipt of complaint…make an investigation…*[and if necessary] *recommend acceptable means and methods", "provide assistance and cooperate with federal agencies, other state agencies…in the exercise of the duties imposed".* In this Chapter "*Nuisance Birds*" are defined as "*…blackbirds, red-winged blackbirds, grackles, cowbirds, pigeons, and starlings, or any other species so declared…when causing or about to cause economic losses in the Commonwealth; becoming detrimental to the public health and welfare; defacing or defiling public or private property or otherwise creating a public nuisance."*

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.

Open Season on Nuisance Species (Code of Virginia § 29.1-511):

"There shall be a continuous open season for killing nuisance species…". In this chapter, "*those species designated as such by regulations of the Board*, *and those species committing or about to commit depredation upon ornamental or shade trees, agricultural crops, wildlife, livestock or other property or when concentrated in numbers and manner as to constitute a health hazard or other nuisance…not include*(ing) *(i) animals designated as endangered or threatened…(ii) animals classified as game or fur-bearing animals…and (iii) those species protected by state or federal law"* are included in the definition of *"nuisance species"* (§ 29.1-100).

Nonmigratory game birds (Code of Virginia § 29.1-514):

This section of the code allows for the hunting of bobwhite quail and wild turkey during prescribed seasons.

Rules and Regulations for Enforcement of the Virginia Pesticide Law (The Virginia Administrative Code (2 VAC 5-670, 680, 685)):

Chapter 39 under Title 3.2 of the Code of Virginia is known as the Virginia Pesticide Control Act. Chapters 670, 680 and 685 of Title 2, Agency 5 of the Virginia Administrative code contain the implementing regulations of the Act. These regulations include the classification and registration of pesticides, the handling, storage and application of pesticides, as well as the certification and registration of sellers and users.

Nuisance Species Designated (The Virginia Administrative Code (4 VAC 15-20-160):

In this section of the Code, the VDWR includes in its definition of nuisance species, European starling, house sparrow, rock pigeon, and "*other nonnative species as defined in the Migratory Bird Treaty Reform*

Act of 2004 and regulated under 50 CFR 10.13". Eurasian collared-dove and monk parakeet meet this definition.

Importation Requirements, Possession and Sale of Nonnative (Exotic) Animals (The Virginia Administrative Code (4 VAC 15-30-40)):

Under this section of the code, a permit is required to import, possess, or sell monk parakeets unless they are captive bred and closed-banded with a seamless band.

Possession, Transportation, and Release of Wildlife by Authorized Persons (The Virginia Administrative Code (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 dispatch wildlife, provided that the methods of and documentation for the capture, possession, transport, release, and humane dispatch shall be in accordance with director policy."*

Unauthorized Feeding of Wildlife (The Virginia Administrative Code (4 VAC 15-40-286)):

"It shall be unlawful for any person …to place, distribute, or allow the placement of food, minerals, carrion, trash, or similar substances when it attracts any species of wildlife in such numbers or circumstances to cause property damage, endanger any person or wildlife, or create a public health concern....This section shall not be construed to restrict bona fide agronomic plantings (including wildlife food plots), bona fide distribution of food to livestock, or wildlife management activities conducted or authorized by the department or U.S. government agencies with wildlife management responsibilities."

Poisoning of Wild Birds and Wild Animals Prohibited; certain control programs excepted (The Virginia Administrative Code (4 VAC 15-40-50)):

"It shall be unlawful to put out poison at any time for the purpose of killing any wild birds and wild animals, provided that rats and mice may be poisoned on one's own property. The provisions of this section shall not apply to the Commissioner of Agriculture and Consumer Services, the United States Department of Agriculture, or their representatives or cooperators, and those being assisted in a control program authorized by those agencies."

CHAPTER 2: ISSUES AND ALTERNATIVES

This chapter contains a discussion of the issues which were used to develop alternatives to address the need for action. It also contains a discussion of Integrated Wildlife Damage Management (IWDM) as well as a description of WS' strategies, decision making process and standard operating procedures (SOPs). Finally, this chapter presents alternatives developed to address the issues and meet the need for action. It also presents alternatives considered but not analyzed in detail, with rationale.

2.1 ISSUES USED TO DEVELOP THE ALTERNATIVES

Issues are concerns of the public and/or professional community that were raised regarding potential adverse effects that might occur from a proposed action. Such issues must be considered in the NEPA decision-making process. Issues related to managing damage associated with birds in Virginia were developed through discussions with partnering agencies, cooperators, and stakeholders.

The issues as they relate to the possible implementation of the alternatives, including the proposed action alternative, are discussed in Chapter 3. The issues analyzed in detail are the following:

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

A common issue when addressing damage caused by animals are the potential impacts of management actions on the populations of target species. A related issue commonly identified as a concern is that damage management activities conducted by WS could affect the ability of hunters to harvest species targeted by management activities. Methods available to resolve damage or threats of damage can be categorized as lethal and nonlethal. Nonlethal methods disperse or otherwise make an area where damage is occurring unattractive or unavailable to the species causing the damage, thereby reducing the presence of those species in the immediate area. Lethal methods remove individuals or the active nests of target species causing the damage, thereby reducing the presence of those species in the area and reducing the local population. The number of target species lethally removed under the alternatives is dependent upon the magnitude of the damage occurring, the level of damage acceptable to individual persons experiencing the damage, the numbers of individual animals involved, and the efficacy of methods employed. Under certain alternatives, both nonlethal and lethal methods could be recommended, as governed by federal, state, and local laws and regulations.

The analysis for the magnitude of impact on the populations of target animals is based on a measure of the number of individuals from each species lethally removed in relation to that species' abundance and/or status (e.g., nuisance species, game species, etc.). Magnitude may be determined either quantitatively or qualitatively. Quantitative determinations are based on population estimates, allowable harvest or lethal removal levels, and actual harvest or lethal removal data. Qualitative determinations are based on population trends and harvest trend data, when available.

The analysis to determine the magnitude of impacts on the populations of those species addressed in this EA from the use of lethal methods would be based on a measure of the number of individuals lethally removed in relation to that species' abundance or status. Lethal removal would be monitored by comparing the number of animals lethally removed with overall populations or trends. Lethal methods would only be used by WS at the request of those persons seeking assistance. The lethal removal of birds addressed in this EA may occur under migratory bird depredation permits issued by the USFWS, under 50 CFR 21.43 (blackbird depredation order), during regulated harvest seasons, or under §29.1-529 of the

Code of Virginia. Lethal removal of non-native birds addressed in this EA may occur without a permit or authorization.

Lethal removal of those species addressed in this EA can occur either without a permit (if those bird species are not native), under 50 CFR 21.43, under §29.1-529 of the Code of Virginia, through the issuance of depredation permits by the USFWS pursuant to the MBTA, or during regulated harvest seasons.

Any activities conducted by WS under the alternatives addressed would occur along with other natural process and human-induced events, such as natural mortality, human-induced mortality from private damage management activities, mortality from regulated harvest, and human-induced alterations of habitat.

Information on bird populations and trends are derived from several sources including surveys and harvest data. Additional information on those sources of information is provided below.

Breeding Bird Survey (BBS)

Coordinated by the United States Geological Survey's (USGS) and the Canadian Wildlife Service, the BBS is conducted on an annual basis during the breeding season across the continental U.S. and southern Canada (Sauer et al. 2017). Under established guidelines, participants count birds at established survey points for a set duration along a pre-determined route, usually along a road. Routes (over 4,100 in all) are 24.5 miles long with the observer stopping every 0.5 miles along the designated route. The numbers of birds observed and heard within 0.25 miles of each survey point during a 3-minute sampling period are recorded. The BBS data can be used to estimate population trends and relative abundances across different geographical areas (see Appendix C). It does not provide population estimates. Current estimates of population trends from BBS data are derived from hierarchical model analysis (Link and Sauer 2002, Sauer and Link 2011) and are dependent upon a variety of assumptions (Link and Sauer 1998). The statistical significance of a trend for a given species is also determined using BBS data (Sauer et al. 2017). Because the population of migratory birds in any given location fluctuates throughout the year as birds move between breeding and wintering grounds, BBS trend data is only useful for monitoring population trends across breeding seasons (e.g., late May through early July).

Christmas Bird Count (CBC)

The CBC is conducted on an annual basis, in December and early January by numerous volunteers under the guidance of the National Audubon Society. Under established guidelines, participants count the number of birds observed within a 15-mile diameter circle around a central point (177 mi^2). The CBC data does not provide a population estimate, but the count can be used as an indicator of trends in the population of a particular bird species over time (i.e., the number of birds frequenting a specific location during the winter months). 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 2010). Because the population of migratory birds in any given location fluctuates throughout the year as birds move between breeding and wintering grounds, CBC trend data is only useful for monitoring population trends across winters.

The Virginia Breeding Bird Atlas Project (VBBAP)

In 1983, the Virginia Society of Ornithology appointed a committee to facilitate and direct a Breeding Bird Atlas in the Commonwealth (Virginia Society of Ornithology 1989). After a one year trial period, data for the atlas was collected from January 1, 1985 through December 31, 1989 (Trollinger and Reay

2001). During this period, volunteer observers recorded the species, location, date and category of breeding behavior observed for all species under a standard methodology. All unusual sightings were verified. All occurrences of breeding behavior observed (1985–1989) were then consolidated and geographically displayed by species (Trollinger and Reay 2001). In 2016, a second Virginia Breeding Bird Atlas collection effort was launched. A collaboration between the Virginia Society of Ornithology, the Virginia Department of Wildlife Resources (VDWR), and others, data will be collected over 5 years (VBBAP 2017).

Virginia's Birdlife: an Annotated Checklist

Since 1952, the Virginia Society of Ornithology, has been compiling and describing the occurrence of birds in the Commonwealth into a state ornithological record. The group maintains high standards for observation, recording and reporting. Peak counts, "the highest number of individuals observed in a given location on a single day" provide a benchmark for the numbers of birds that have been observed.

Virginia Colonial Waterbird and Peregrine Falcon Surveys

The Center for Conservation Biology at William and Mary – Virginia Commonwealth University in Cooperation with VDWR, The Nature Conservancy and other partners conducts surveys within the state to monitor nesting colonial waterbirds and peregrine falcons. The colonial waterbird survey uses fixed-wing aircraft and follow-up ground counts to map colonies and estimate populations. These surveys were conducted in 1993, 2003, 2008, 2013 and 2018. However financial constraints did not enable comprehensive surveys of widely distributed great blue heron and great egret colonies in 2008 and 2018. Colonial waterbird population estimates were based on counts of active nests and when this is impractical, the number of adults present (Watts and Paxton 2019). Annual peregrine falcon monitoring begins with surveys of nesting structures by foot or boat for the presence of adults or nesting activity. Sites with confirmed activity are then surveyed 2 to 5 more times to document breeding activity, band young and document fledging success (Watts and Watts 2017).

Annual Hunter Harvest Estimates

Hunting seasons for game birds classified as migratory under the MBTA are established under frameworks developed by the USFWS and implemented by the VDWR. Species that fall into this category that are addressed in this EA include: mourning dove, clapper rail, Virginia rail, sora, American woodcock, Wilson's snipe, American crow and fish crow. The USFWS and state wildlife agencies have in place a program whereby licensed migratory game bird hunters must register annually in the state in which they hunt. Each state wildlife agency is responsible for collecting the name, address, and date of birth from each migratory bird hunter, asking them general questions about their harvest, and sending this information to the USFWS. The USFWS then utilizes this data to conduct detailed surveys to estimate and prepare reports on the number of birds harvested annually (Raftovich et al. 2016). Bobwhite quail and wild turkey are protected by state law.

Partners in Flight Population Estimates Database

The Partners in Flight (PIF) Population Estimates Database provides breeding population estimates for birds in the continental U.S. and Canada at various spatial scales. These estimates are primarily derived from BBS data collected from 2006 through 2015 using methods outlined in Rosenberg and Blancher (2005) and updated by Blancher et al. (2013). Other estimates are derived from independent sources. An update to the database in 2019 addressed some limitations of the methodology but did not fully address others (see Stanton et al. 2019).

Management Information System (MIS)

WS personnel are responsible for documenting their activities (e.g., dispersal of animals, unintentional capture of animals, lethal removal of animals etc.) (WS Directive 4.205). WS documents these activities using a record system called the Management Information System (MIS) (WS Directive 4.130). Procedures detailed in WS Directives ensure information recorded and included in this document is an accurate and complete record of WS' activities. MIS does not include activities of other entities (e.g., lethal removal by airport employees at an airport where WS is also conducting lethal removal).

Service Permit Issuance and Tracking System (SPITS)

USFWS issues permits under various laws and treaties, including the MBTA. The Service Permit Issuance and Tracking System (SPITS) is USFWS's current record system which requires USFWS Permits staff enter all data into the database. SPITS generates records for each permit issued to an individual or organization. USFWS uses SPITS to track authorized and reported take of migratory birds (by permittee, by year, by state, by geographic region, etc). Beginning in late 2020 and continuing through 2021, USFWS began replacing SPITS with ePermits, a modernized cross-programmatic online permit processing system. ePermits allows applicants to apply for permits, receive permits, and report activities through the online ePermits platform. More ePermits functionality will continue to be added to the new system throughout 2021 and beyond.

Issue 2 - Effects of Damage Management Activities on Nontarget animals, including threatened and endangered species

A common issue when addressing damage caused by animals are the potential impacts of management actions on nontarget species, including threatened and endangered species. Nonlethal methods have the potential to inadvertently disperse or otherwise impact nontargets. Lethal methods remove individuals of the species causing the damage, thereby reducing the presence of those species in the area and the local population. However, lethal methods also have the potential to inadvertently capture or kill nontargets.

The Endangered Species Act (ESA) makes it illegal for any person to 'take' any listed endangered or threatened species or their critical habitat. The ESA defines take as, "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct" (16 USC 1531-1544). Critical habitat is a specific geographic area or areas that are essential for the conservation of a threatened or endangered species. The ESA requires that federal agencies conduct their activities in a way to conserve species. It also requires that federal agencies consult with the appropriate implementing agency (either the USFWS or the NMFS) prior to undertaking any action that may take listed endangered or threatened species or their critical habitat pursuant to Section 7(a)(2) of the ESA.

There may also be concerns that WS' activities could unintentionally result in the "take" of eagles that may be near or within the vicinity of WS' activities. Under 50 CFR 22.3, the term "take", as it is defined by the Bald and Golden Eagle Act includes but is not limited to activities which "capture", "trap" or "disturb" eagles.

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

An additional issue often raised is the potential risks to human health and safety associated with the methods employed to manage damage caused by birds. Both chemical and non-chemical methods have the potential to have adverse effects on human health and safety. Risks can occur to persons employing methods, to persons coming into contact with methods or persons harvesting and then consuming animals

which have been previously immobilized with drugs. Risks can be inherent to the method itself or related to the misuse of the method.

Safety of Chemical Methods Employed

Potential risks to human health and safety associated with chemical methods are related to the potential for human exposure either through direct or indirect contact with the chemical. Under the alternatives analyzed in detail, chemical methods could be employed or recommended including but not limited to avicides (i.e., pesticides used to kill birds), reproductive inhibitors, and repellants. All these chemical methods except for Mesurol would be available under all of the alternatives analyzed in detail.

The use of chemical methods is strictly regulated by the U.S. Department of Justice, Drug Enforcement Administration (DEA), EPA, FDA and VDACS. Restricted use chemicals can only be applied by persons who have been specially trained and certified by the VDACS for their use. All the chemical methods listed above, including methods available for use to the public, have specific requirements for their handling, transport, storage, use and disposal according to the product labels and under state and federal laws. Additional information about these methods can be found in Appendix E.

Safety of Non-Chemical Methods Employed

Most methods available to manage damage and threats associated with birds are considered non-chemical methods. Non-chemical methods available can be grouped into two categories: nonlethal and lethal. Nonlethal methods disperse or otherwise make an area where damage is occurring unattractive or unavailable to the species causing the damage, thereby reducing the presence of those species in the area. Examples of nonlethal methods include resource management, physical exclusion, frightening devices or deterrents, capture with live capture devices and inactive nest destruction. All these methods are designed to disperse, exclude or make the area where damage is occurring unattractive or unavailable to the animals which are associated with the damage. Lethal methods remove individuals of target species causing the damage, thereby reducing the presence of those species in the area, and reducing the local population. Lethal methods include egg and active nest destruction, shooting, capture and euthanasia, or the reduction of a local population by hunting. All these non-chemical methods available to address damage would be available for use under any of the alternatives and could be employed by any entity, when permitted.

Like chemical methods, non-chemical methods, if misused, could potentially be hazardous to human health and safety. The primary safety risk of most non-chemical methods occurs directly to the person employing the method. However, risks to others do exist when employing non-chemical methods, such as when using firearms. All the non-chemical methods available to address damage would be available for use by any entity, when permitted, under all the alternatives analyzed in detail.

Issue 4 – Humaneness and Animal Welfare Concerns

The issue of humaneness and animal welfare, as it relates to the killing or capturing of animals 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."

Suffering has previously been described by the American Veterinary Medical Association (AVMA), as a "…highly unpleasant emotional response usually associated with pain and distress" (AVMA 1987). However, suffering "…can occur without pain…," and "…pain can occur without suffering…" because

suffering carries with it the implication of occurring over time, 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. 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 has previously stated that "[f]or wild and feral animals, many of the recommended means of euthanasia for captive animals are not feasible. In field circumstances, wildlife biologists generally do not use the term euthanasia, but terms such as killing, collecting, or harvesting, recognizing that a distress-free death may not be possible" (AVMA 2001).

Pain and suffering, as it relates to methods available for use to manage animal damage has both a professional and lay point of arbitration. The professional community and the public would be better served to recognize the complexity of defining suffering, because "…neither medical nor veterinary curricula explicitly address suffering or its relief" (California Department of Fish and Game 1991). Research suggests that some methods can cause "stress" (Kreeger et al. 1990). However, such research has not yet progressed to the development of objective, quantitative measurements of pain or stress for use in evaluating humaneness (Bateson 1991).

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

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

Issue 5 – Effects of Damage Management Activities on the Aesthetic Values of Birds

An additional issue raised is that activities to alleviate damage and threats associated with birds would result in the loss of the aesthetic benefits of these birds to persons in the area where damage management activities take place. Animals are generally regarded as providing utilitarian, monetary, recreational, scientific, ecological, existence and historic values (Conover 2002). These benefits can be tangible or intangible. Both recreational and existence values are related in part to aesthetics. Aesthetics is the philosophy dealing with the nature of beauty or the appreciation of beauty. Therefore, aesthetics is truly subjective in nature and dependent upon what an observer regards as beautiful.

Many people enjoy watching or hearing wildlife and take pleasure from knowing they exist. In modern societies a large percentage of households have pets. However, some people may consider individual wild animals as "pets" and exhibit affection towards these animals.

The values people place on animals is unique to the individual and can be based on many factors. Because these values differ, public attitudes toward animals vary considerably. To alleviate damage, some people support lethal removal, some people believe that all animals should be captured and relocated or handed over to local law enforcement or animal control authorities while others strongly

oppose any management and want management agencies to teach tolerance. Some of the people who oppose removal do so because of human-affectionate bonds with individual animals. Attitudes can also differ significantly depending upon if the individual is affected by the damage or threats of damage. As stated previously, methods available to alleviate damage or reduce threats either disperse or otherwise make an area where damage is occurring unattractive or unavailable to the species causing the damage, or alternatively, lethally remove individuals of the species causing the damage. These activities reduce the presence of target species in the area where damage is occurring. Therefore, these activities have the potential to affect the aesthetic values of birds depending upon the values, philosophies, attitudes and opinions of individuals.

2.2 DAMAGE MANAGEMENT STRATEGIES

Integrated Wildlife Damage Management (IWDM)

The most effective approach to resolving wildlife damage is to use an adaptive integrated approach that may call for the use of several methods simultaneously or sequentially. The philosophy behind IWDM is to implement methods in the most effective manner while minimizing the potentially harmful effects to humans, target and nontarget species, and the environment. IWDM may incorporate cultural practices (e.g., crop selection), habitat modification (e.g., exclusion), animal behavior modification (e.g., scaring), removal of individual offending animals, local population reduction, elimination of invasive species (e.g., European starlings) or any combination of these, depending on the circumstances of the specific damage problem.

The IWDM Strategies Employed by WS

Direct Operational Assistance
Direct operational assistance includes damage management activities that are directly conducted or supervised by WS personnel. Direct operational assistance may be initiated when the problem cannot effectively be resolved through technical assistance alone and when a Memorandum of Understanding, Cooperative Service Agreement, or other comparable document provides for direct damage management by WS. The initial investigation defines the nature, history, and extent of the problem, species responsible for the damage, and methods available to resolve the problem.

Technical Assistance Recommendations
Technical assistance is the provision of information, recommendations and demonstrations on available and appropriate wildlife damage management methods and approaches. The implementation of damage management actions is the responsibility of the requester with no direct involvement by WS. In some cases, WS provides supplies or materials that are not readily available. Technical assistance may be provided through a personal or telephone consultation, or during an on-site visit with the requester. Generally, several management strategies are described to the requester for short and long-term solutions to damage problems. These strategies are based on the level of risk, need, and the practicality of their application. In some instances, wildlife-related assistance provided to the requestor by WS results in tolerance and / or acceptance of the situation. In other instances, management options are discussed and recommended.

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

Education

An important component of technical assistance is education. Education is important because wildlife damage management is about finding compromise 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 dissemination of information and recommendations to those persons requesting assistance with reducing damage or threats, WS provides lectures, courses, and demonstrations to producers, homeowners, Commonwealth and county agents, colleges and universities, and other interested groups on damage management. Additionally, technical papers are presented at professional meetings and conferences so that other natural resource professionals are kept up to date on recent developments in damage management technology, programs, agency policies, laws and regulations.

Research and Development

Another important component of technical assistance is the development of new methods. The National Wildlife Research Center (NWRC) functions as the research unit of WS. NWRC uses scientific expertise to develop methods to resolve conflicts between humans and animals while maintaining the quality of the human environment. NWRC research biologists work closely with wildlife managers, researchers, and others to develop and evaluate damage management techniques. NWRC biologists have authored hundreds of scientific publications and reports and are respected worldwide for their expertise.

Wildlife Services Decision Making

WS personnel use a thought process for evaluating and responding to damage complaints which is depicted by the WS Decision Model and described by Slate et al. (1992) (Figure 2.1). WS personnel are frequently contacted after requesters have tried or considered nonlethal methods and found them to be impractical, too costly, or inadequate to reduce damage. WS personnel assess the problem and evaluate the appropriateness and availability (legal and administrative) of strategies and methods based on biological, economic and social factors. Methods deemed practical for the situation are then developed into a management strategy. WS would continue to monitor and evaluate the situation as assistance (either technical or direct) is provided, modifying the strategy and methods used to reduce the damage to an acceptable level. In terms of the WS Decision Model (Slate et al. 1992), 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.

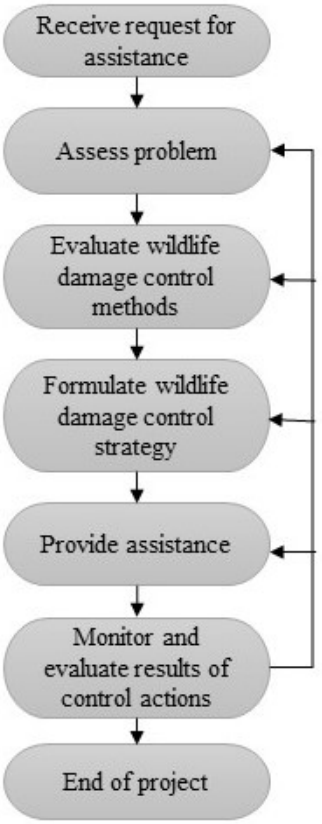


Figure 2.1 WS Decision Model as presented by Slate et al. (1992) for developing a strategy to respond to a request for assistance with human-wildlife conflicts.

Community-based Decision Making

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

depending on the alternative selected. WS and other state, tribal and federal wildlife management agencies may facilitate discussions at local community meetings when resources are available.

Requests for assistance to manage damage caused by wildlife often originate from the decision-maker(s) based on community feedback or from concerns about damage or threats to human safety. As representatives of the community, the decision-maker(s) can provide the information to local interests either through technical assistance provided by WS or through demonstrations and presentation by WS on bird damage management activities. This process allows decisions on bird damage management activities to be made based on local input. They may implement management recommendations provided by WS or others on their own, or may request management assistance from WS, other wildlife management agencies, local animal control agencies, or private businesses or organizations.

2.3 STANDARD OPERATING PROCEDURES FOR BIRD DAMAGE MANAGEMENT

WS' directives and standard operating procedures (SOPs) improve the safety, selectivity, and efficacy of animal damage management activities. WS' directives and SOPs would be incorporated into activities conducted by WS when addressing damage and threats associated with birds.

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

WS would use the WS Decision model to identify and determine the most appropriate damage management strategies and their potential impacts (WS Directive 2.201).

WS would apply an integrated approach (WS Directive 2.101) and evaluate methods for appropriateness (WS Directive 2.105).

All pesticides have to be registered with the EPA and the VDACS, and must have labels approved by the agency which details the product's ingredients, the type of pesticide, the formulation, classification, approved uses and formulations, potential hazards to humans, animals and the environment as well as directions for use. The registration process for pesticides is intended to assure minimal adverse effects to humans, animals and the environment when chemicals are used in accordance with label directions. Under the FIFRA and its implementing guidelines, it is a violation of federal law to use any pesticide in a manner that is inconsistent with its label. WS would follow and use all pesticides according to their label. WS recommendations for use would not differ from label requirements.

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

All personnel using firearms would be trained according to WS Directive 2.615.

WS' use of traps or other capture devices would comply with WS Directive 2.450.

Direct operational assistance would only be conducted by WS after a memorandum of understanding, cooperative service agreement, or other comparable document listing all the methods the property owner or manager will allow to be used on property they own and/or manage was signed by WS and those requesting assistance.

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

WS would comply with all applicable federal, Commonwealth, and local laws and regulations in accordance with WS Directive 2.210.

WS' personnel would use bait, trap placements, and capture devices that are strategically placed at locations likely to capture a target animal and minimize the potential of nontarget animal captures.

2.4 ADDITIONAL STANDARD OPERATING PROCEDURES SPECIFIC TO THE ISSUES

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

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

- Lethal removal of birds by WS would be monitored by the USFWS and the VDWR to ensure cumulative lethal removal is considered as part of population management objectives.
- WS would monitor bird damage management activities to ensure activities do not adversely affect their populations in the Commonwealth.
- The use of nonlethal methods would be considered prior to the use of lethal methods when providing technical assistance and direct operational assistance.
- Management actions would be directed toward specific animals or groups of animals causing damage or threats.

Issue 2 - Effects of Damage Management Activities on Nontarget animals, including threatened and endangered species

- When appropriate, suppressed firearms would be used to minimize noise impacts.
- Nontarget animals captured in traps would be released unless it was determined that the animal would not survive and/or that the animal could not be released safely.
- WS has evaluated the potential risks to federally listed threatened and endangered species in accordance with the ESA.
- WS would review the current federal threatened and endangered species list for Virginia each year to determine if new species have been added and will evaluate potential impacts to those species from bird damage management activities.
- WS personnel are trained and experienced in the identification of animal damage, the identification of animals responsible for the damage, and in the selection of and implementation of methods which are as species-specific as possible, thus reducing the risks to nontarget animals including threatened and endangered species.
- Management actions are directed towards specific animals or groups of animals responsible for causing damage or posing threats.

- WS consults with the USFWS or the NMFS and the VDWR to determine the potential risks to federally and state listed threatened and endangered species in accordance with the ESA and Commonwealth laws.

- Nonlethal methods are given priority when addressing requests for assistance (WS Directive 2.101).

- To limit the possibility of secondary hazards to nontarget animals which scavenge and consume birds which are killed, WS would retrieve all dead birds to the extent possible and dispose of them in accordance with WS Directive 2.515.

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

- Damage management activities would be conducted away from areas of high human activity. If this is not possible, then activities would be conducted during periods when human activity is low (e.g., early morning) whenever possible.

- All chemicals used by WS or recommended by WS would be registered with the EPA, FDA and/ or the VDACS, as appropriate.

- 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.

- WS identifies hazards in advance of work assignments and provides employees with personal protective equipment (PPE). Employees must adhere to safety requirements and use appropriate PPE. WS employees are required to work cooperatively to minimize hazards and immediately report unsafe working conditions (WS Directive 2.601).

- WS would only conduct bird damage management activities on a given property in response to a request for assistance after the property owner or manger has signed a document agreeing to allow the use of specific methods on property they own and/or manage.

Issue 4 – Humaneness and Animal Welfare Concerns

- WS personnel would be trained in the latest and most humane devices and methods for removing birds.

- WS' use of traps or other capture devices would comply with WS Directive 2.450.

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

Issue 5 – Effects of Damage Management Activities on the Aesthetic Values of Birds

- WS would set capture devices to minimize visibility of captured animals in compliance with WS Directive 2.450.

2.5 ALTERNATIVES CONSIDERED IN DETAIL

Alternatives were developed for consideration based on the issues using the WS Decision model (Slate et al. 1992). The alternatives will receive detailed analysis in Chapter 3. Chapter 2 also discusses alternatives considered but not analyzed in detail, with rationale.

The following alternatives were developed to address the identified issues associated with managing damage and threats associated with birds:

Alternative 1 – WS Would Continue to Address Bird Damage through an Adaptive Integrated Approach (Proposed Action / No Action Alternative)

The proposed action/no action alternative would continue the current implementation of an adaptive integrated approach utilizing nonlethal and lethal techniques, as deemed appropriate using the WS Decision Model, to reduce damage and threats associated with birds. Under this alternative, WS could respond to requests for assistance for managing damage and threats associated with birds by: 1) taking no action, if warranted, 2) providing technical assistance to property owners or managers on actions they could take to reduce damage or threats of damage, or 3) providing technical assistance and direct operational assistance to a property owner or manager experiencing damage or threats of damage. Direct operational assistance could be provided when funding is available through federal appropriations or cooperative funding. WS' response to requests for assistance is dependent upon on those persons initiating the request. Those persons receiving technical assistance could 1) take no action, 2) choose to implement WS' recommendations on their own, 3) use the services of a private nuisance wildlife control agent, 4) use volunteer services of private individuals or organizations (e.g., hunters), 5) use the services of local law enforcement or animal control authorities (in the case of free-ranging domestic and feral birds) or 6) use the services of WS (direct operational assistance) when available. Direct operational assistance would only be conducted by WS after a memorandum of understanding, cooperative service agreement, or other comparable document listing all the methods the property owner or manager will allow to be used on property they own and/or manage was signed by WS and those requesting assistance.

The most effective approach to resolving any animal damage problem is to use an adaptive integrated approach (IWDM) that may call for the use of several methods simultaneously or sequentially. This approach is used by WS for providing both technical and direct operational assistance. WS personnel use a thought process for evaluating and responding to requests for assistance detailed in the WS Decision Model (See ***Wildlife Services Decision Making***). IWDM may incorporate both nonlethal and lethal methods depending upon the circumstances of the specific damage problem. Nonlethal methods disperse or otherwise make an area where the damage is occurring unattractive or unavailable to the species causing the damage, thereby reducing the presence of those species in the area. Nonlethal methods would be given priority when addressing requests for assistance (WS Directive 2.101). However, nonlethal 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 those requesting assistance have already used nonlethal methods, WS would not likely recommend or continue to employ those particular methods because their use has already been proven ineffective in adequately resolving the damage or threat. When effective, nonlethal methods would disperse birds from the area resulting in a reduction in the presence of those birds at the site.

Lethal methods remove individuals or active nests (nests with eggs or chicks present) of the species causing the damage, thereby reducing the presence of those species in the area and the local population. Lethal methods are often employed or recommended to reinforce nonlethal methods and to remove birds that have been identified as causing damage or posing a threat of damage as part of an integrated approach. The number of birds or active nests 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 individual birds or active nests involved with the associated damage or threat, and the efficacy of methods employed. Under this alternative, WS may recommend individual birds or active nests be lethally removed to reduce the number of birds causing damage.

Depredation Permits
Lethal take of individual birds or active nests can occur either: without a permit (if those species are non-native), during hunting seasons, under 50 CFR 21.43, under §29.1-529 of the Code of Virginia, or through the issuance of depredation permits by the USFWS. Currently, as part of the application process, the USFWS requires that permittees contact WS to obtain a recommendation (technical assistance) for how to address the wildlife damage problem. Under the proposed action, WS would evaluate the situation and then issue a recommendation that describes the damage, species involved, number of individual birds involved, previous actions taken to address the problem and recommendations for how to address the problem. Recommendations could include nonlethal actions and when appropriate, the recommendation that USFWS issue a depredation permit for lethal actions. However, the USFWS requires that available nonlethal actions are used where possible and practical, and that these non-lethal actions are shown to be ineffective prior to issuing a permit for lethal actions. USFWS also requires permittees continue long-term nonlethal actions to eliminate or reduce the need for permitted lethal removal. USFWS then reviews the application completed by the property owner or manager and the recommendation issued by WS and makes a determination to issue or not issue a depredation permit. Upon a receipt of a depredation permit, the property owner or manager or an appropriate designated sub-permittee may then commence the authorized activities. Permittees must submit a written report of their activities upon expiration of the permit. Permits may be renewed annually as needed to resolve continuing damage or threats of damage.

Appendix E contains a thorough discussion of the methods available for use in managing damage and threats associated with birds under this alternative. All the methods listed in the Appendix would be available under this alternative although not all methods would be available for direct implementation by all persons (e.g., Mesurol is only available for use by WS).

The WS program follows the "*co-managerial approach*" to solve wildlife damage or conflicts as described by Decker and Chase (1997). Within this management model, when numerous people are being affected by damage or threats associated with birds, and a request for assistance is made, WS advocates providing technical assistance to the affected persons or local decision maker(s). Requests for assistance often originate from community representatives who have been notified by community members concerned about damage and threats associated with birds. By involving decision-maker(s) in the process, damage management actions can be presented to allow decisions on damage management to involve those individuals that the decision maker(s) represent. Local decision-maker(s) could represent the local community's interest and make decisions for the community or they could relay technical assistance information to a higher authority or the community for discussion and decision-making. Local decision-maker(s) could also request that WS present technical assistance information at public meetings to allow for involvement of the community. Involving the appropriate representatives of the community ensures a community-based decision is made. In the case of private property, 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.

Alternative 2 – WS Would Address Bird Damage by Providing Technical Assistance and Nonlethal Direct Operational Assistance

Under this alternative, WS could continue to provide those persons requesting assistance with managing damage and threats associated with birds with technical assistance as described in Alternative 1 (WS

could recommend both nonlethal and lethal techniques in an adaptive integrated approach). Additionally, WS could provide direct operational assistance, but would only utilize nonlethal techniques. When the circumstances of a specific damage problem called for the use of lethal methods, WS could recommend those persons requesting assistance: 1) implement lethal methods on their own, 2) use the services of a private nuisance wildlife control agent, 3) use volunteer services of private individuals or organizations (e.g., hunters), or 4) use the services of local law enforcement or animal control authorities (in the case of free-ranging domestic and feral birds). WS would not provide direct operational assistance utilizing lethal techniques. Appendix E contains a thorough discussion of the methods available for use in managing damage and threats associated with birds. All methods listed in the Appendix could be available under this alternative.

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

Alternative 3 – WS Would Not Address Bird Damage

Under this alternative, WS would not conduct technical or direct operational assistance to reduce threats or alleviate damage associated with birds. WS would not be involved with any aspect of managing damage associated with birds. All requests for assistance received by WS to resolve damage caused by birds would be referred to the USFWS, VDWR, the VDACS, local law enforcement or animal control authorities and/or private entities. This alternative would not prevent other federal, Commonwealth, and/or local agencies, including private entities from conducting damage management activities directed at alleviating damage and threats associated with birds. Except for Mesurol, all methods listed in Appendix E could be available under this alternative.

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

2.6 ALTERNATIVES CONSIDERED BUT NOT ANALYZED IN DETAIL WITH RATIONALE

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

WS Would Implement Nonlethal Methods before Lethal Methods

This alternative would require that all nonlethal methods or techniques described in Appendix E be applied to all requests for assistance to reduce damage and threats associated with birds. Nonlethal 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 damage. If the use of all nonlethal methods failed to resolve the damage or threat, lethal methods would then be employed to resolve the damage.

Those persons experiencing damage or threats often employ nonlethal methods prior to contacting WS for assistance. 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 nonlethal applications are necessary before the initiation of lethal methods. Thus, only the presence or absence of nonlethal methods can be evaluated. The proposed action (Alternative 1) described is similar to a nonlethal before lethal alternative because the use of nonlethal methods must be considered before lethal methods by WS (see WS Directive 2.101). Adding a nonlethal before lethal alternative and the associated analysis would not add additional information to the analyses in the EA.

WS Would Use Lethal Methods Only

Under this alternative, the only methods available for recommendation and use in resolving damage or threats associated with birds would be the lethal methods described in Appendix E. This is in direct conflict with WS Directive 2.101, which directs that WS must consider the use of nonlethal methods before lethal methods. Therefore, this alternative was not considered in detail.

WS Would Only Trap and Translocate Birds

Under this alternative, all requests for assistance would be addressed using live-capture methods or the recommendation of live-capture methods described in Appendix E followed by translocation (the transport and release of an animal from one area to another). Birds are managed by the USFWS, the VDWR and/or local law enforcement and animal control authorities and translocation of them could only occur under their authority.

Although there may be exceptions (see Pullins et al. 2018), translocation of animals is generally ineffective in reducing damage and would therefore be ineffective at meeting the need for action because birds are highly mobile and can easily return to damage sites from long distances, and translocation may result in damage problems at the new location (Fischer and Lindenmayer 2000, Seddon et al. 2012). Many animals show strong homing behavior (Bingman and Cheng 2005) and may return to the site after being relocated (Pullins et al. 2018). Additionally, given the scope of the issue described in the need for action (Chapter 1), it would be unrealistic to translocate the numbers of animals necessary to reduce damage. There is a perception among some individuals that animals which are translocated because they are causing damage 'live happily ever after' (Craven et al. 1998). Unfortunately however, these animals typically have high mortality rates because of the stress of capture, transport and release, aggression by animals of the same species already occupying the new location, disorientation, unsuitable habitat, difficulties finding resources (food, water, shelter) at the new location, attempts to return to the site of capture and increased susceptibility to predation or disease (Nielsen 1988, Craven et al. 1998, Fischer and Lindenmayer 2000, Seddon et al. 2012). Translocation of animals may also result in the transmission of diseases from one area to another (Nielsen 1988). For these reasons, translocation of the majority of wildlife species, including birds, is discouraged by WS policy (see WS Directive 2.501) and was not analyzed further.

WS Would Use Regulated Hunting to Manage Damage Associated with Birds

Under this alternative, all requests for assistance received by WS would be addressed by recommending the use of regulated hunting to reduce populations of those birds causing damage. The VDWR establishes and enforces regulated hunting seasons under frameworks determined by the USFWS. Hunting by private individuals when based on biological information and properly regulated can be effectively used to manage wildlife populations. However, regulated hunting is often not allowed in all locations where damage occurs (e.g., airports, urban areas), during times of year when damage occurs (e.g., when agricultural crops are most vulnerable), is not allowed for many species, or may not remove enough animals to reduce the damage (e.g., because of method restrictions).

Harvest of birds can only occur at the discretion of the USFWS and/or the VDWR, which ensures that removal occurs to achieve desired population objectives for each species. Therefore, regulated hunting

could continue to occur under any of the alternatives analyzed in detail at the discretion of the appropriate regulatory authority. Under Alternative 1 (the proposed action alternative) and Alternative 2, WS could recommend, when appropriate, that hunting be used by the resource owner or manager on property they own or manage where damage is occurring. However, allowing hunting would be the decision of the owner or manager of the property. Since WS does not have the ability to require hunting to resolve damage, this alternative was not analyzed in detail.

WS Would Eradicate or Suppress Populations of Birds in the Commonwealth that are Causing Damage

Under this alternative, all requests for assistance would be addressed using the eradication or suppression of, or the recommendation of eradication or suppression of bird populations that are causing damage. Wild birds are managed by the USFWS and/or the VDWR and eradication or suppression of their populations could only occur under the authority of the appropriate regulatory authority. The eradication of any native species is not a desired management goal. Since eradication is not a desired management goal for native species, an eradication alternative was not considered in detail.

The suppression of bird populations would require that WS respond to requests for assistance by using or recommending the managed reduction of populations of birds causing damage. In areas where damage can be attributed to localized populations of birds, WS could decide to implement local population suppression using the WS Decision Model. Typically, WS' activities would be conducted on a very small portion of the sites or areas inhabited or frequented by problem species. However, it is not realistic or practical to consider large-scale population suppression as the basis of the WS program. Nor is the large-scale population suppression of native animals a desired management goal. Therefore, this alternative was not considered in detail.

WS Would Use Reproductive Control to Reduce Populations of Birds in the Commonwealth that are Causing Damage

Under this alternative, the only method available by WS for recommendation or use in resolving damage or threats associated with birds would be reproductive control. Reproductive control for wildlife can be accomplished either through sterilization (permanent) or contraception (reversible). However, the use and effectiveness of reproductive control as a wildlife population management tool is limited by characteristics of the species (e.g., life expectancy, age at onset of reproduction, population size, etc.), the nature of the local environment (e.g., isolation of target population, access to target individuals, etc.), and other biological factors. In general, if the time needed to reduce damage is a factor in selecting a management method, lethal control will always be more efficient than reproductive control because reproductive control cannot generate a more rapid population decline (Dolbeer 1998). In addition to being biologically feasible, reproductive control methods need to be logistically feasible and economically practical.

Although research is ongoing, no known reproductive inhibitors have been registered by the EPA for use in many species of wildlife (Fagerstone et al. 2010, Yoder and Miller 2006). Current technology requires direct contact with animals for both the application of sterilization and contraception methods. The need to capture or make direct contact with a sufficiently large number of target animals with multiple treatments (in the case of contraceptives) to effectively implement this method places considerable logistic and economic constraints on the adoption of reproduction control as a wildlife management tool for many species. Given these constraints, and the lack of availability of chemical reproductive inhibitors for the management of many species, this alternative was not evaluated in detail.

Currently, the only reproductive inhibitor that is registered with the EPA for use in any of the species addressed in this document is nicarbazin (OvoControl® P). Nicarbazin was officially registered by the EPA in 2007 for use in reducing fertility in rock pigeons in urban areas (Avery et al. 2008). Nicarbazin would be available for use by certified pesticide applicators under any of the alternatives.

WS Would Use Egg and Active Nest Destruction Only to Reduce Populations of Birds in the Commonwealth that are Causing Damage

Under this alternative, the only method available by WS for recommendation or use in resolving damage or threats associated with birds would be egg and active nest destruction. While egg removal or destruction can reduce production of young, merely destroying an egg does not reduce a population as quickly as removing adults (Cooper and Keefe 1997). 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 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 and egg destruction is not an efficient or cost-effective damage management or population reduction approach. If the time needed to reduce damage is a factor in selecting a management method, lethal removal of adult birds will always be more efficient because other methods cannot generate as rapid a population decline (Dolbeer 1998). Additionally, methods need to be logistically feasible and economically practical (e.g., time and ability to locate and destroy all active nests).

WS Would Provide Financial Compensation for Damage Associated with Birds

Under this alternative, WS would provide financial compensation to those persons requesting assistance who were experiencing damage associated with birds. This alternative would include site visits to verify damage and identify the species involved. WS would not provide direct operational assistance. The assumption of financial compensation programs for animal damage is that offsetting damages financially can reduce or eliminate any incentive for those persons experiencing damage to lethally remove animals (Bulte and Rondeau 2005). WS does not have the legal authority to provide financial compensation for damage; only manage the damage or threats of damage.

This EA evaluates different alternatives to meet the need for action. The need for action is to reduce damage and threats associated with birds. Providing financial compensation to those persons experiencing damage would be ineffective at meeting the need for action because it does not reduce damage and threats. Because providing financial compensation would fail to meet the need for action, this alternative was not considered further.

CHAPTER 3: ENVIRONMENTAL EFFECTS

This chapter provides information for making an informed selection among the alternatives identified and described in Chapter 2; a selection which not only addresses the need for action identified in Chapter 1, but also addresses the issues identified in Chapter 2. Specifically, this chapter analyzes the environmental consequences of each of the alternatives as those alternatives relate to the issues identified in Chapter 2. Additionally, this chapter compares the environmental consequences of the proposed action / no action alternative to the environmental consequences of the other alternatives.

Environmental consequences can be direct, indirect, and/or cumulative.

Direct Effects: Caused by the action and occur at the same time and place.

Indirect Effects: These are impacts caused by an action that occur later in time or further removed in distance but are still reasonably foreseeable.

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

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 included in any of the alternatives analyzed.

3.1 ISSUES CONSIDERED IN DETAIL AND THEIR ASSOCIATED ENVIRONMENTAL CONSEQUENCES BY ALTERNATIVE

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 federal and state agencies.

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

The issue of the potential direct and cumulative impacts of conducting the alternatives on the populations of target bird populations is analyzed for each alternative below.

Alternative 1 – WS Would Continue to Address Bird Damage through an Adaptive Integrated Approach (Proposed Action / No Action Alternative)

The proposed action / no action alternative would continue the current implementation of an adaptive integrated approach utilizing nonlethal and lethal techniques, as deemed appropriate using the WS Decision Model, to reduce damage and threats associated with birds as described in Chapter 2.

The issue of the effects on target species arises from the use of nonlethal and lethal methods to address the need for reducing damage and threats (Appendix E). However, the primary concern would be from the use of lethal methods. Nonlethal methods may disperse or otherwise make an area where damage is occurring unattractive or unavailable to the species (target species) causing the damage, thereby reducing the presence of those species in the area. Alternatively, nonlethal methods may involve the live-capture

and relocation of or the transfer of custody of individual animals to other entities (e.g., the state wildlife agency) which would also reduce the presence of these species in an area. When effective, nonlethal methods would result in a reduction in the presence of those animals at the site where damage is occurring (and a reduction in damage) but have minimal impact on those species' populations. WS would not employ or recommend nonlethal methods be employed over large geographic areas or at such intensity that essential resources would be unavailable and that long-term adverse impacts to bird populations would occur.

Under the proposed action / no action alternative, WS could live-capture and relocate (or the transfer of custody of) target species to manage damage or threats of damage (Table 3.1). There should be little adverse impact on individual birds or bird populations from the live-capture and relocation of birds (Pitlik and Washburn 2016, Schafer and Washburn 2016, Pullins et al. 2018). Birds live-captured and relocated may also receive leg bands for identification purposes. Leg bands, when properly applied, should have no adverse impact on the individual bird or the population (Varland et al. 2007, Bildstein and Peterjohn 2012). The live-capture and relocation of birds can only occur at the discretion of the USFWS and VDWR. Banding of birds can only occur at the discretion of the USGS. WS would report its live-capture, relocation and banding activities to the proper authority as required.

Nonlethal methods are generally regarded as having minimal impacts on overall populations because individuals of those species are unharmed. The use of nonlethal methods would not have adverse population impacts under any of the alternatives. Effects of nonlethal methods on species listed as threatened by the Commonwealth are analyzed in detail below.

Table 3.1 – Target species which could be live captured and relocated under the proposed action / no action alternative.

Species	Highest annual live-capture and relocation by WS 2011-2017[a]	Proposed maximum annual live-capture and relocation by WS
osprey	5	100
Mississippi kite	0	20
northern harrier	0	50
sharp-shinned hawk	5	100
Cooper's hawk	15	150
red-shouldered hawk	14	150
broad-winged hawk	0	40
red-tailed hawk	43	250
rough-legged hawk	4	40
barn owl	4	50
eastern screech-owl	0	20
great horned owl	10	50
snowy owl	1	10
barred owl	3	50
long-eared owl	0	20
short-eared owl	0	100
American kestrel	47	300
merlin	0	20
peregrine falcon	0	20

[a]Data reported by federal fiscal year, obtained from WS' Management Information System (MIS) system. WS did not utilize live-capture and relocation prior to September 2014. Use of this method has increased

over time in an effort to reduce lethal removal. WS anticipates an increase in the number of requests for assistance for this method in the future.

Lethal methods reduce damage or threats by removing animals from the area where damage is occurring. The effect of lethal methods on target species populations and regulated harvest would be monitored by comparing the number of each species lethally removed with that species' overall population (when available) and / or population trend (when available) and / or the magnitude of lethal removal in comparison to other known lethal removal occurring (when available) to assure the magnitude of lethal removal is maintained below the level that would cause adverse effects to the viability of species' populations. For information about limitations of population estimates (e.g., PIF database) and trends (e.g., BBC, CBC), please see (Chapter 2, section 1).

Inconsequential/Undetectable Target Species Removal:

The potential impacts on target bird populations from the implementation of the proposed action / no action alternative are analyzed for each species. Target species are analyzed in detail below when:
1) WS' proposed maximum annual lethal removal is greater than 1.0% of the estimated Virginia population, or
2) if Virginia population estimates are unavailable, when WS' proposed maximum annual lethal removal is greater than 0.05% of the North American or combined U.S. and Canadian population or
3) target species have been identified by USFWS as Species of Conservation Concern (Appendix D) or
4) target species are classified as a game species in Virginia.

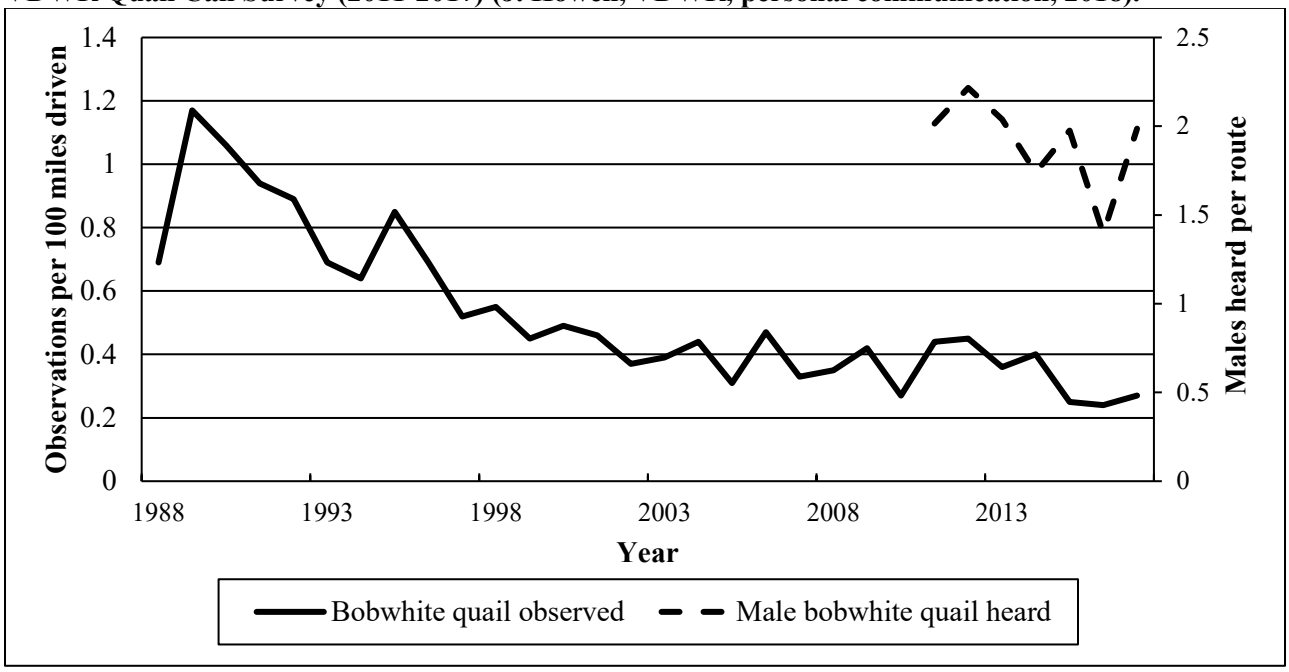
Bird management conducted by WS is often associated with species that have healthy and thriving populations. Impacts to target species which do not meet the parameters detailed in the paragraph above can be found in Appendix F. WS' limited proposed lethal removal of species in Appendix F are inconsequential and/or undetectable and should not have any significant direct or cumulative impact on bird populations. Furthermore, WS' proposed removal combined with other forms of mortality are not expected to create significant indirect or cumulative impacts to these species' populations. With the exception of Eurasian collared-doves and house sparrows, lethal removal of these birds can only occur at the discretion of the USFWS. The USFWS ensures lethal removal of birds protected under the MBTA occurs to achieve desired objectives. WS would report the number of lethally removed birds or active nests protected by the MBTA annually to the USFWS.

Northern Bobwhite Population Impact Analysis

Widely distributed across Eastern North America, the northern bobwhite is a well-recognized non-migratory game bird (Billerman et al. 2020). Northern bobwhite can be found year-round throughout the Commonwealth in early successional patchy habitat (Billerman et al. 2020). These birds can nest multiple times per year, laying an average of 12 to 14 eggs per nesting attempt (range: 1 to 13) (Billerman et al. 2020). Apart from mating season, northern bobwhites are highly social, congregating in groups or coveys of less than 8 to more than 18 birds (Billerman et al. 2020).

Trend data from the Virginia BBS from 1966-2015, and 2005-2015 indicates that northern bobwhite populations have decreased at an annual rate of 5.45% and 4.51% respectively (Sauer et al. 2017). Trend data from 1966-2015 from the Commonwealth's CBC indicates that northern bobwhite populations have declined (National Audubon Society 2010). Similarly, surveys of rural mail carriers' observations of bobwhite quail conducted in cooperation with the VDWR from 1988 to 2017, as well as surveys of singing bobwhite male bobwhite quail conducted by VDWR from 2011 to 2017, indicate a declining trend (Figure 3.1). The Commonwealth's quail population is unknown. The Partners in Flight Science Committee (2019) estimates that there are 5.2 million northern bobwhites in the U.S. and Canada.

Figure 3.1 – Number of bobwhite quail observed per 100 miles driven during the VDWR Rural Mail Carrier survey (1988-2017) and number of male bobwhite quail heard per route during the VDWR Quail Call Survey (2011-2017) (J. Howell, VDWR, personal communication, 2018).



No northern bobwhites or active northern bobwhite nests were lethally removed by WS in Virginia from 2011 to 2017 and WS did not use nonlethal methods to disperse any northern bobwhites during this period. Northern bobwhites can be harvested during a regulated harvest season. The number of bobwhites harvested by hunters from 2011 to 2017 is shown in Table 3.2.

Table 3.2 - Number of northern bobwhites harvested by hunters in Virginia from 2011 to 2017.

Year	Hunter Harvest[a]
2011	104,073
2012	No survey conducted
2013	172,148
2014	No survey conducted
2015	115,703
2016	No survey conducted
2017	No survey conducted
AVERAGE	**130,641**

[a]Data reported by state fiscal year, VDGIF 2012, Kidd et al. 2014*a*, VDGIF 2016.

Direct, Indirect, and Cumulative Effects:
In anticipation of requests for assistance, WS could lethally remove up to 50 northern bobwhites and remove or destroy up to 20 active northern bobwhite nests annually under the proposed action / no action alternative to manage damage or threats of damage.

The lethal removal of up to 50 northern bobwhites annually by WS would represent 0.03% of the average number of northern bobwhites harvested by hunters in Virginia (130,641 birds). Alternatively, it would represent 0.0009% of the estimated population of the U.S. and Canada (5.2 million). If average annual hunter harvest remains the same, annual cumulative removal by all entities under the proposed action

alternative could be estimated at 130,691 birds (50 birds by WS, 130,641 birds by hunters). This is equivalent to 2.5% of the population of the U.S. and Canada. WS' lethal removal would be a limited component of the overall lethal removal occurring and should not have any significant direct or cumulative impact on northern bobwhite populations. WS anticipates requests to address northern bobwhites from airports. Airports are restricted areas where hunting is not permitted. Therefore, WS' lethal removal of northern bobwhites is likely to occur in locations where it will not limit the ability to harvest northern bobwhites. WS' lethal removal would be a limited component of the overall harvest and could be considered of low magnitude when compared to the number of northern bobwhites being harvested. Harvest and lethal removal of northern bobwhites can only occur at the discretion of the VDWR. The VDWR ensures harvest and lethal removal occurs to achieve desired objectives. WS would report the number of northern bobwhites lethally removed annually to the VDWR.

Additionally, impacts due to the destruction of active nests should have little adverse impact on the northern bobwhite population. Many bird species can identify areas with regular human disturbance and low reproductive success, relocating and nesting elsewhere when confronted with repeated nest failure. Although there may be reduced fecundity for the individuals affected by nest and egg destruction, this activity has no long-term effect on breeding adult birds. This method is used by WS to inhibit nesting in an area experiencing damage due to nesting activity and is employed only at the localized level. The destruction of up to 20 active northern bobwhite nests annually by WS would occur in localized areas where nesting takes place and would not reach a level where adverse effects on northern bobwhite populations would occur.

Wild Turkey Population Impact Analysis

A non-migratory bird, wild turkeys can be found from Southern Canada south across the U.S. (Billerman et al. 2020). Once extirpated from two-thirds of the Commonwealth because of deforestation, burning, grazing and cultivation, wild turkeys can now be found statewide in suitable habitat (Virginia Department of Game and Inland Fisheries 2014). In the eastern U.S., wild turkeys inhabit hardwood, mixed, and pine forests (Billerman et al. 2020). Wild turkeys nest once per year, laying 12 to 15 eggs on average (Billerman et al. 2020). However, birds will re-nest if their first nesting attempt is unsuccessful (Billerman et al. 2020). Apart from mating season, wild turkeys are highly social, congregating in flocks of up to 40 individuals (Billerman et al. 2020).

Trend data from the Virginia BBS from 1966-2015, and 2005-2015 indicates that wild turkey populations have increased at an annual rate of 5.65% and 7.38% respectively (Sauer et al. 2017). Similarly, trend data from 1966-2015 from the Commonwealth's CBC indicates that wild turkey populations have also increased (National Audubon Society 2010). The Commonwealth's turkey population could be estimated by assuming annual harvest is 10% of the total population. If an average of 30,523 wild turkeys are harvested annually, the Commonwealth's population could be estimated at 305,230 wild turkeys (G. Norman, VDWR, personal communication 2013). The Partners in Flight Science Committee (2019) estimates that there are 6.7 million wild turkeys in the U.S. and Canada.

The number of wild turkeys lethally removed by WS to alleviate damage and threats in Virginia (under §29.1-529 of the Code of Virginia) is shown in Table 3.3. No active wild turkey nests were destroyed by WS during this period. The number of wild turkeys or active wild turkey nests lethally removed by other entities during this period is unknown. WS dispersed an average of 132 wild turkeys on an annual basis from 2011 to 2017 to alleviate damage and threats. Wild turkeys can be harvested during regulated harvest seasons. Male turkeys can be harvested during an annual spring hunting season and both male and female turkeys can be harvested during an annual fall hunting season. The number of wild turkeys harvested by hunters from 2011 to 2017 is shown in Table 3.3.

Table 3.3 - Number of wild turkeys addressed in Virginia from 2011 to 2017.

Year	WS' Lethal Removal Under §29.1-529 (CoVA)[ab]	Hunter Harvest	
		Spring Season	Fall Season
2011	19	15,689[c]	3,470[c]
2012	7	15,326[c]	4,432[c]
2013	12	19,265[c]	5,351[c]
2014	18	17,582[c]	2,988[c]
2015	14	20,580[d]	3,283[d]
2016	10	17,243[d]	3,120[d]
2017	12	18,860[d]	2,368[d]
AVERAGE	**13**	**25,418**	**5,105**

[a]Data reported by federal fiscal year, obtained from WS' Management Information System (MIS) system.
[b]Removal by other entities under §29.1-529 is unknown, G. Norman, VDWR, personal communication, 2018.
[c]G. Norman, VDWR, personal communication, 2015
[d]VDGIF 2018a, VDGIF 2018b

Direct, Indirect, and Cumulative Effects:
Based on previous requests for assistance and in anticipation of an increase in the number of requests for assistance, WS could lethally remove up to 100 wild turkeys and remove or destroy up to 20 active wild turkey nests annually under the proposed action / no action alternative to manage damage or threats of damage.

The lethal removal of up to 100 wild turkeys annually by WS would represent 0.3% of the average number of wild turkeys harvested by hunters in Virginia (30,523 birds) or 0.03% of the estimated population in the state (305,230 birds) or 0.001% of the estimated population of the U.S. and Canada (6.7 million birds). If average annual hunter harvest remains the same, annual cumulative removal by all entities under the proposed action alternative could be estimated at 30,623 birds (100 birds by WS, 30,523 birds by hunters). This is equivalent to 10.0% of the Virginia population or 0.46% of the population of the U.S. and Canada. WS' lethal removal would be a limited component of the overall lethal removal occurring and should not have any significant direct or cumulative impact on wild turkey populations. Most requests received by WS to address wild turkeys are received from airports. Although airports are restricted areas where hunting is not generally permitted, on some airports harvest of wild turkeys does occur during the regulated harvest season by approved personnel. However, this harvest can only occur where it is practical, and season length, bag limits, and sex restrictions prohibit effective management of wild turkeys at these facilities. WS' lethal removal of wild turkeys is likely to occur in locations and at times where lethal removal will not limit the ability to harvest turkeys. WS' lethal removal could be considered of low magnitude when compared to the number of wild turkeys being harvested. Harvest and lethal removal of wild turkeys can only occur at the discretion of the VDWR. The VDWR ensures harvest and lethal removal occurs to achieve desired objectives. WS would report the number of wild turkeys lethally removed annually to the VDWR.

Additionally, impacts due to the destruction of active nests should have little adverse impact on the wild turkey population. Many bird species can identify areas with regular human disturbance and low reproductive success, relocating and nesting elsewhere when confronted with repeated nest failure. Although there may be reduced fecundity for the individuals affected by nest and egg destruction, this activity has no long-term effect on breeding adult birds. This method is used by WS to inhibit nesting in an area experiencing damage due to nesting activity and is employed only at the localized level. The destruction of up to 20 active wild turkey nests annually by WS would occur in localized areas where nesting takes place and would not reach a level where adverse effects on wild turkey populations would

occur. As with the lethal removal of birds, the removal of active nests must be authorized by the VDWR. Therefore, the number of active nests removed by WS annually would occur at the discretion of the VDWR.

Pied-billed Grebe Population Impact Analysis

Pied-billed grebes can be observed in all the lower 48 states and in the Commonwealth year-round (Billerman et al. 2020). Habitat includes both fresh and brackish water wetlands, ponds, lakes, slow moving rivers and coastal areas (Billerman et al. 2020). If the first nesting attempt is successful, birds will raise a second brood of young (Billerman et al. 2020). During the breeding season birds can be observed in mated pairs with and without young (Billerman et al. 2020). Outside of the breeding season, birds congregate in flocks of up to 20,000 individuals (Billerman et al. 2020). Flocks of more than 400 birds have been observed during the winter in the Commonwealth's coastal plain (Rottenborn and Brinkley 2007).

According to BBS trend data, pied-billed grebe populations in the Eastern U.S. BBS survey region declined 0.46% annually from 1966-2015, but increased 2.45% annually from 2005-2015 (Sauer et al. 2017). No trend data from the BBS in Virginia is available (Sauer et al. 2017). The number of pied-billed grebes observed in the Commonwealth during the CBC has shown a declining trend since 1966 (National Audubon Society 2010). There are no population estimates for pied-billed grebes in Virginia. Population estimates for individual BCRs are unavailable (BCR 14 and 30) or approximate (BCR 27, 28 and 29 (~2,300 pairs)) and may need revision because of a lack of data (MANEM 2006, Hunter et al. 2006). The population of pied-billed grebes in North America has been estimated at 125,000 birds (MANEM 2006) and 100,000 to 150,000 birds (Wetlands International 2012). These birds are included on USFWS's regional list of bird species of concern (Appendix D).

The number of pied-billed grebes lethally removed by WS or other entities to alleviate damage and threats in Virginia from 2011 to 2017 is shown in Table 3.4. No active pied-billed grebe nests were destroyed during this time. WS dispersed an average of 9 pied-billed grebes on an annual basis from 2011 to 2017 to alleviate damage and threats.

Table 3.4 – Number of pied-billed grebes addressed in Virginia from 2011 to 2017

	Removal under Depredation Permits		
Year	Authorized Lethal Removal[a]	WS' Lethal Removal[bc]	Total Lethal Removal by All Entities[ad]
2011	40	7	5
2012	65	10	15
2013	65	12	17
2014	65	17	19
2015	75	19	18
2016	75	21	13
2017	75	11	3
AVERAGE	**66**	**14**	**13**

[a]Data reported by calendar year, obtained from USFWS's Service Permit Issuance and Tracking System (SPITS) system, A. McCollum, USFWS, personal communication, 2018
[b]Data reported by federal fiscal year, obtained from WS' Management Information System (MIS) system
[c]WS' removal conducted under depredation permits issued to WS and other entities where WS is a subpermittee
[d]Includes WS' lethal removal as reported by USFWS's SPITS system

Direct, Indirect, and Cumulative Effects:
Based on previous requests for assistance and in anticipation of an increase in the number of requests for assistance, WS could lethally remove up to 100 pied-billed grebes and remove and destroy up to 10 pied-billed grebe nests annually under the proposed action / no action alternative to manage damage or threats of damage.

Based on the best available information, the lethal removal of up to 100 pied-billed grebes annually by WS would represent 2.2% of the approximate breeding population in BCR 27, 28 and 29 or anywhere from 0.1% to 0.07% of the North American population. From 2011 to 2017, an average of 13 pied-billed grebes were lethally removed on an annual basis by *all* entities in the Commonwealth. If this lethal removal is reflective of future lethal removal by *other* entities, the annual cumulative lethal removal by *all* entities under the proposed action alternative could be estimated at 113 birds (13 birds by other entities, 100 by WS). This is equivalent to 2.5% of the approximate breeding population in BCR 27, 28 and 29 or alternatively 0.1% to 0.08% of the North American population. Given the limited magnitude of lethal removal proposed by WS when compared to the estimated population, WS' proposed lethal removal should not have any significant direct or cumulative impact on pied-billed grebe populations. Lethal removal of pied-billed grebes can only occur at the discretion of the USFWS. The USFWS ensures lethal removal occurs to achieve desired objectives. WS would report the number of pied-billed grebes lethally removed annually to the USFWS.

Additionally, impacts due to the destruction of active nests should have little adverse impact on the pied-billed grebe population. This method is used by WS to inhibit nesting in an area experiencing damage due to nesting activity and is employed only at the localized level. The destruction of up to 10 pied-billed grebe nests annually by WS would occur in localized areas where nesting takes place and would not reach a level where adverse effects on grebe populations would occur. As with the lethal removal of birds, the removal of nests must be authorized by the USFWS. Therefore, the number of nests removed by WS annually would occur at the discretion of the USFWS.

Horned Grebe Population Impact Analysis

Horned grebes can be observed throughout most of the U.S. and Canada (Billerman et al. 2020). During migration and the non-breeding season, horned grebes can be observed in the Commonwealth's coastal areas and on inland freshwater bodies of water (Billerman et al. 2020). During the time of year that horned grebes may be present in Virginia, birds can be observed in flocks up to 500 individuals (Billerman et al. 2020). Peak counts of these birds in the Commonwealth have occurred most recently in Cape Charles, Virginia (450 individuals, 2005) (Rottenborn and Brinkley 2007). Horned grebes generally nest only once per year (Billerman et al. 2020).

According to BBS trend data, horned grebe populations in the Eastern U.S. BBS survey region have declined 1.12% annually from 1966-2015 but increased 0.72% annually from 2005-2015 (Sauer et al. 2017). No trend data from the BBS in Virginia is available (Sauer et al. 2017). The number of horned grebes observed in the Commonwealth during the CBC has shown a declining trend since 1966 (National Audubon Society 2010). There are no population estimates for these birds in the Commonwealth. Nisbet et al. (2013) estimates that during the non-breeding season, 10,000 horned grebes can be observed from the Bay of Fundy south to the Straits of Florida. The population of horned grebes in North America is estimated at more than 100,000 birds (MANEM 2006; Nisbet et al. 2013). These birds are included on USFWS's regional list of bird species of concern (Appendix D).

Although lethal removal was authorized, no horned grebes were lethally removed by WS or other entities to alleviate damage and threats in Virginia from 2011 to 2017. No active horned grebe nests were

destroyed during this time (horned grebes are not known to nest in Virginia). WS dispersed an average of seven horned grebes on an annual basis from 2011 to 2017 to alleviate damage and threats.

Direct, Indirect, and Cumulative Effects:
Based on previous requests for assistance and in anticipation of an increase in the number of requests for assistance, WS could lethally remove up to 20 horned grebes annually under the proposed action / no action alternative to manage damage or threats of damage.

Based on the best available information, the lethal removal of up to 20 horned grebes annually by WS would represent 0.2% of the population of these birds during the non-breeding season along the east coast of North America or 0.02% of the North American population. From 2011 to 2017, no horned grebes were lethally removed by WS or other entities in the Commonwealth. If the lethal removal by other entities remains stable, the annual cumulative lethal removal by all entities under the proposed action alternative could be estimated at 20 birds. Given the limited magnitude of lethal removal proposed by WS when compared to the estimated population, WS' proposed lethal removal should not have any significant direct or cumulative impact on horned grebe populations. Lethal removal of horned grebes can only occur at the discretion of the USFWS. The USFWS ensures lethal removal occurs to achieve desired objectives. WS would report the number of horned grebes lethally removed annually to the USFWS.

Rock Pigeon Population Impact Analysis

Rock pigeons, also known as rock doves, are a non-native species that were first introduced into the U.S. by European settlers as a domestic bird (Billerman et al. 2020). Rock pigeon populations are now found throughout the U.S., Southern Canada, and Mexico and can be observed year-round in the Commonwealth (Billerman et al. 2020). Breeding occurs year-round and birds in one Kansas study averaged 6.5 nests per year (Billerman et al. 2020). Rock pigeons are closely associated with humans, residing where human structures and activities provide them with food and sites for roosting, loafing, and nesting (Billerman et al. 2020). Social birds, rock pigeons are normally observed in pairs or flocks (Billerman et al. 2020).

Trend data for the number of rock pigeons observed in the Commonwealth along routes surveyed during the BBS indicates that populations decreased at an annual rate of 2.66% from 1966-2015 and 2.35% from 2005 to 2015 (Sauer et al. 2017). The number of rock pigeons observed in the Commonwealth during the CBC has shown a declining trend since 1966 (National Audubon Society 2010). The Partners in Flight Science Committee (2019) estimates the Virginia population of rock pigeons is 100,000 birds and that the population in the U.S. and Canada is 16 million birds.

The number of rock pigeons and active rock pigeon nests lethally removed by WS to alleviate damage and threats in Virginia from 2011 to 2017 is shown in Table 3.5. Rock pigeons are a non-native species not protected by state or federal law. Therefore, the total number of rock pigeons or active rock pigeon nests lethally removed by entities other than WS during this time is unknown. WS dispersed an average of 2,078 rock pigeons on an annual basis from 2011 to 2017 to alleviate damage and threats.

Table 3.5 – Number of rock pigeons addressed by WS in Virginia from 2011 to 2017

Year	WS' Lethal Removal[a]	
	Birds	Active Nests
2011	2,857	6
2012	1,503	0
2013	2,789	0
2014	1,892	0
2015	1,344	2
2016	1,105	5
2017	1,383	0
AVERAGE	**1,839**	**2**

[a]Data reported by federal fiscal year, obtained from WS' Management Information System (MIS) system

Direct, Indirect, and Cumulative Effects:
Based on previous requests for assistance and in anticipation of an increase in the number of requests for assistance, WS could lethally remove up to 10,000 rock pigeons and remove and destroy up to 500 rock pigeon nests annually under the proposed action / no action alternative to manage damage or threats of damage.

WS' proposed lethal removal of up to 10,000 rock pigeons annually would represent 10% of the statewide population and 0.06% of the population of the U.S. and Canada. Rock pigeons are a non-native species and therefore not protected by the state or federal government. Executive Order 13112 directs Federal agencies to use their programs and authorities to detect and respond rapidly to control (or eradicate) populations of invasive species. While elimination of these birds would be beneficial to the environment, WS' lethal removal under the proposed action alternative would not pose any significant direct or cumulative impacts to rock pigeon population.

Additionally, impacts due to the destruction of active nests should have little adverse impact on the rock pigeon population. This method is used by WS to inhibit nesting in an area experiencing damage due to nesting activity and is employed only at the localized level. The destruction of up to 500 rock pigeon nests annually by WS would occur in localized areas where nesting takes place and would not reach a level where adverse effects on pigeon populations would occur.

Mourning Dove Population Impact Analysis

Mourning doves are one of the most abundant and widespread birds in North America (Billerman et al. 2020). They can be found year-round throughout most of the continental U.S. including Virginia (Billerman et al. 2020). Mourning doves are habitat generalists which have benefitted from human changes to the environment (Billerman et al. 2020). They prefer open habitats and can be found in rural, suburban and urban environments (Billerman et al. 2020). Birds can raise multiple broods (Billerman et al. 2020). Mourning doves are social birds, and during the breeding season have been observed in flocks of up to 50 birds (Billerman et al. 2020).

BBS trend data from the Commonwealth indicates that mourning dove populations declined at an annual rate of 0.15% from 1966-2015 but increased at an annual rate of 0.02% from 2005-2015 (Sauer et al. 2017). The number of doves observed during call-count surveys designed to provide an index of abundance for mourning doves from 2003 through 2012 showed a stable trend in Virginia (Seamans et al. 2013). These surveys were discontinued after the 2013 report year (2012) (Seamans 2018). The number of mourning doves observed in the Commonwealth during the CBC has shown an increasing trend since 1966 (National Audubon Society 2010). The Partners in Flight Science Committee (2019) estimates that

the Virginia population of mourning doves is 1,400,000 birds and that the population in the U.S. and Canada is 130 million birds.

The number of mourning doves and active mourning dove nests lethally removed by WS or other entities to alleviate damage and threats in Virginia from 2011 to 2017 is shown in Table 3.6. WS dispersed an average of 7,466 mourning doves on an annual basis from 2011 to 2017 to alleviate damage and threats. Mourning doves can be harvested during regulated harvest seasons. The number of mourning doves harvested by hunters from 2011 to 2017 is shown in Table 3.6.

Table 3.6 – Number of mourning doves addressed in Virginia from 2011 to 2017.

	Removal Under Depredation Permits						
	Birds			Active Nests			
Year	Authorized Lethal Removal[ab]	WS' Lethal Removal[cd]	Total Lethal Removal by All Entities[aef]	Authorized Lethal Removal[ab]	WS' Lethal Removal[cd]	Total Lethal Removal by All Entities[aef]	Hunter Harvest[g]
2011	3,021	1,761	581	10	0	0	245,900
2012	3,785	1,329	2,043	10	0	0	295,900
2013	4,285	1,468	574	10	7	3	251,500
2014	4,335	1,267	619	30	18	12	160,700
2015	4,945	833	630	40	12	10	229,500
2016	4,945	711	945	40	10	0	208,600
2017	5,220	600	569	50	12	12	262,600
AVERAGE	**4,362**	**1,138**	**852**	**27**	**8**	**5**	**236,386**

[a]Data reported by calendar year, obtained from USFWS's Service Permit Issuance and Tracking System (SPITS) system, A. McCollum, USFWS, personal communication, 2018
[b]Includes birds authorized to be killed subsequent to capture if relocation is not possible
[c]Data reported by federal fiscal year, obtained from WS' Management Information System (MIS) system, includes nontarget lethal removal
[d]WS' removal conducted under depredation permits issued to WS and other entities where WS is a subpermittee
[e]Includes WS' lethal removal as reported by USFWS's SPITS system
[f]Includes birds that were reported as being captured and relocated or killed (if relocation was not possible) by USFWS's SPITS system
[g]Raftovich and Wilkins 2013, Raftovich et al. 2015, Raftovich et al. 2017, and Raftovich et al. 2018

Direct, Indirect, and Cumulative Effects:
Based on previous requests for assistance and in anticipation of an increase in the number of requests for assistance, WS could lethally remove up to 4,000 mourning doves and remove or destroy up to 100 active mourning dove nests annually under the proposed action / no action alternative to manage damage or threats of damage.

The lethal removal of up to 4,000 mourning doves annually by WS would represent 1.7% of the average number of mourning doves harvested by hunters in Virginia from 2011 to 2017. Alternatively, it would represent 0.3% of the estimated population in the state or 0.003% of the population in the U.S. and Canada. From 2011 to 2017, an average of 852 mourning doves were lethally removed on an annual basis by *all* entities in the Commonwealth. If this lethal removal is reflective of future lethal removal by *other* entities, and average annual hunter harvest remains the same, the annual cumulative lethal removal by *all* entities under the proposed action alternative could be estimated at 241,238 birds (852 birds by other entities, 4,000 by WS, 236,386 by hunters). This is equivalent to 17.2% of the estimated population in the state or 0.19% of the population in the U.S. and Canada. Given the limited lethal removal proposed by WS to alleviate damage and threats when compared to the hunter harvest, and estimated populations, WS' proposed lethal removal should not have any significant direct or cumulative impact on mourning dove populations. Most requests received by WS to address mourning doves are received from airports.

Airports are restricted areas where hunting is generally not permitted. Therefore, WS' lethal removal of mourning doves is likely to occur in locations where it will not limit the ability to harvest mourning doves. WS' lethal removal would be a limited component of the overall harvest and lethal removal occurring and could be considered of low magnitude when compared to the number of mourning doves being harvested and lethally removed. Lethal removal can only occur at the discretion of the USFWS and harvest can only occur within regulations established by USFWS in cooperation with VDWR. These entities ensure activities occur to achieve desired population objectives. WS would report the number of mourning doves lethally removed annually to the USFWS and the VDWR.

Additionally, impacts due to the destruction of active nests should have little adverse impact on the mourning dove population. Many bird species can identify areas with regular human disturbance and low reproductive success, relocating and nesting elsewhere when confronted with repeated nest failure. Although there may be reduced fecundity for the individuals affected by nest and egg destruction, this activity has no long-term effect on breeding adult birds. This method is used by WS to inhibit nesting in an area experiencing damage due to nesting activity and is employed only at the localized level. The destruction of up to 100 active mourning dove nests annually by WS would occur in localized areas where nesting takes place and would not reach a level where adverse effects on mourning dove populations would occur. As with the lethal removal of birds, the removal of active nests must be authorized by the USFWS. Therefore, the number of active nests removed by WS annually would occur at the discretion of the USFWS.

Clapper Rail Population Impact Analysis

Typically found in salt marshes, clapper rails can be found along the East Coast of the U.S. and south to Mexico and the Caribbean (Billerman et al. 2020). Clapper rails can be observed year-round (Billerman et al. 2020). Birds may raise more than one brood and form loose colonies (but this may be associated with habitat quality) (Billerman et al. 2020). During the Cape Charles, Virginia 1998 CBC, 138 clapper rails were observed (Rottenborn and Brinkley 2007).

According to BBS trend data, clapper rail populations in the Eastern BBS survey region have declined 1.21% annually from 1966-2015 and increased 0.54% annually from 2005-2015 (Sauer et al. 2017). No trend data from the BBS in Virginia is available (Sauer et al. 2017). Clapper rails have only been observed once in the Commonwealth during CBC surveys since 1966, therefore no trend data is available (National Audubon Society 2010). There are no clapper rail population estimates available for Virginia. However, Hunter et al. (2006) estimated that 36,000 individuals reside in BCR 27 (the Southeastern coastal plain).

Although lethal removal was authorized, no clapper rails or active clapper rail nests were lethally removed by WS or other entities to alleviate damage and threats in Virginia from 2011 to 2017. WS did not disperse any clapper rails on an annual basis from 2011 to 2017 to alleviate damage and threats. Clapper rails can be harvested during a regulated harvest season. The number of clapper rails harvested by hunters in Virginia is unavailable. However, the cumulative number of all species of rails (i.e., clapper, king (*Rallus elegans*) and Virginia) harvested by hunters in Virginia and the number of individual species harvested in the Atlantic Flyway are available (Table 3.7, Table 3.8). Using this data, and assuming the percentage of individual species harvested in the Atlantic Flyway are representative of what is harvested in Virginia, we calculated that on average an estimated 3,649 (99% of 3,686 birds) clapper rails could be harvested on an annual basis in Virginia.

Table 3.7 – Number of clapper, king and Virginia rails harvested in Virginia from 2011 to 2017

Year	Hunter Harvest[ab]
2011	4,400
2012	3,700
2013	2,000
2014	4,100
2015	4,200
2016	3,800
2017	3,600
AVERAGE	**3,686**

[a]Combined clapper, King and Virginia rail harvest, harvest of each individual species is unknown.
[b]Raftovich and Wilkins 2013, Raftovich et al. 2015, Raftovich et al. 2017, and Raftovich et al. 2018

Table 3.8 Total number of rails harvested and percentage of total rail harvest in the Atlantic Flyway 2011-2017[a]

Year	Virginia rail	clapper rail	king rail
2011	100	8,800	0
2012	100	12,600	0
2013	100	7,800	0
2014	<50	6,900	0
2015	100	20,700	0
2016	100	10,500	0
2017	100	10,500	0
AVERAGE	93 or <1%	11,114 or >99%	0

[a]Raftovich and Wilkins 2013, Raftovich et al. 2015, Raftovich et al. 2017, and Raftovich et al. 2018

Direct, Indirect, and Cumulative Effects:
In anticipation of requests for assistance, WS could lethally remove up to 20 clapper rails and remove or destroy up to 20 active clapper rail nests annually under the proposed action / no action alternative to manage damage or threats of damage.

Based on the best available information, the lethal removal of up to 20 clapper rails annually by WS would represent 0.5% of the average number of clapper rails harvested by hunters in Virginia. If average annual hunter harvest remains the same, annual cumulative removal by all entities under the proposed action alternative could be estimated at 3,669 birds (20 birds by WS, 3,649 birds by hunters). This is equivalent to 10.2% of the estimated population in BCR 27 (36,000 birds). WS' lethal removal would be a limited component of the overall lethal removal occurring and should not have any significant direct or cumulative impact on clapper rail populations. WS anticipates requests to address clapper rails from airports. Airports are restricted areas where hunting is not permitted. Therefore, WS' lethal removal of clapper rails is likely to occur in locations where it will not limit the ability to harvest clapper rails. WS' lethal removal would be a limited component of the overall harvest and could be considered of low magnitude when compared to the number of clapper rails being harvested and lethally removed. Lethal removal can only occur at the discretion of the USFWS and harvest can only occur within regulations established by USFWS in cooperation with VDWR. These entities ensure activities occur to achieve desired population objectives. WS would report the number of clapper rails lethally removed annually to the USFWS and the VDWR.

Additionally, impacts due to the destruction of active nests should have little adverse impact on the clapper rail population. Many bird species can identify areas with regular human disturbance and low reproductive success, relocating and nesting elsewhere when confronted with repeated nest failure.

Although there may be reduced fecundity for the individuals affected by nest and egg destruction, this activity has no long-term effect on breeding adult birds. This method is used by WS to inhibit nesting in an area experiencing damage due to nesting activity and is employed only at the localized level. The destruction of up to 20 active clapper rail nests annually by WS would occur in localized areas where nesting takes place and would not reach a level where adverse effects on clapper rail populations would occur. As with the lethal removal of birds, the removal of active nests must be authorized by the USFWS. Therefore, the number of active nests removed by WS annually would occur at the discretion of the USFWS.

Virginia Rail Population Impact Analysis

The Virginia rail is a secretive freshwater marsh bird which can be observed across much of the U.S., including Virginia (Billerman et al. 2020). Virginia rails nest in northern latitudes and migrate south during the nonbreeding season (Billerman et al. 2020). Birds have been known to raise more than one brood (Billerman et al. 2020). In the Commonwealth, these birds can be observed year-round in suitable habitat (Billerman et al. 2020). Birds may form aggregations (but this is likely related to a concentration of resources) (Billerman et al. 2020).

According to BBS trend data, populations in the Eastern BBS survey region have increased 0.59% annually from 1966-2015, and 1.72% annually from 2005-2015 (Sauer et al. 2017). No trend data from the BBS in Virginia is available (Sauer et al. 2017). The number of Virginia rails observed in the Commonwealth during the CBC has shown a declining trend since 1966 (National Audubon Society 2010). There are no Virginia rail population estimates available for Virginia. However, Wires et al. (2010) estimated that 1,780 to 3,040 individuals reside in BCR 12 and 37,600 to 74,100 reside in BCR 13 during the breeding season. Although none of Virginia falls within BCR 12 or 13, regions which encompass the Great Lakes and Saint Laurence River, birds which breed in these regions are likely the same birds which can be observed wintering in Virginia.

Although lethal removal was authorized, no Virginia rails or active Virginia rail nests were lethally removed by WS or other entities to alleviate damage and threats in Virginia from 2011 to 2017. WS did not disperse any Virginia rails from 2011 to 2017 to alleviate damage and threats. Virginia rails can be harvested during a regulated harvest season. The number of Virginia rails harvested by hunters in Virginia is unavailable. However, the cumulative number of all species of rails (i.e., clapper, king (*Rallus elegans*) and Virginia) harvested by hunters in Virginia and the number of individual species harvested in the Atlantic Flyway are available (Table 3.7, Table 3.8). Using this data, and assuming the percentage of individual species harvested in the Atlantic Flyway are representative of what is harvested in Virginia, we calculated that on average an estimated 37 (1% of 3,686 birds) Virginia rails could be harvested on an annual basis in Virginia.

Direct, Indirect, and Cumulative Effects:
In anticipation of requests for assistance, WS could lethally remove up to 20 Virginia rails and remove or destroy up to 20 active Virginia rail nests annually under the proposed action / no action alternative to manage damage or threats of damage.

Based on the best available information, the lethal removal of up to 20 Virginia rails annually by WS would represent 54% of the average number of Virginia rails harvested by hunters in Virginia. Alternatively, it would represent 0.05% to 0.03% of the estimated population in BCR 12 and 13 (39,380 to 77,140). If average annual hunter harvest remains the same, annual cumulative removal by all entities under the proposed action alternative could be estimated at 57 birds (20 birds by WS, 37 birds by hunters). This is equivalent to 0.1 to 0.07% of the estimated population in BCR 12 and 13. WS' lethal removal would be a limited component of the overall lethal removal occurring and should not have any

significant direct or cumulative impact on Virginia rail populations. WS anticipates requests to address Virginia rails from airports. Airports are restricted areas where hunting is not permitted. Therefore, WS' lethal removal of Virginia rails is likely to occur in locations where it will not limit the ability to harvest Virginia rails. WS' lethal removal would be a limited component of the overall harvest and could be considered of low magnitude when compared to the number of Virginia rails being harvested and lethally removed. Lethal removal can only occur at the discretion of the USFWS and harvest can only occur within regulations established by USFWS in cooperation with VDWR. These entities ensure activities occur to achieve desired population objectives. WS would report the number of Virginia rails lethally removed annually to the USFWS and the VDWR.

Additionally, impacts due to the destruction of active nests should have little adverse impact on the Virginia rail population. Many bird species can identify areas with regular human disturbance and low reproductive success, relocating and nesting elsewhere when confronted with repeated nest failure. Although there may be reduced fecundity for the individuals affected by nest and egg destruction, this activity has no long-term effect on breeding adult birds. This method is used by WS to inhibit nesting in an area experiencing damage due to nesting activity and is employed only at the localized level. The destruction of up to 20 active Virginia rail nests annually by WS would occur in localized areas where nesting takes place and would not reach a level where adverse effects on Virginia rail populations would occur. As with the lethal removal of birds, the removal of active nests must be authorized by the USFWS. Therefore, the number of active nests removed by WS annually would occur at the discretion of the USFWS.

Sora Population Impact Analysis

Sora can be observed across most of the U.S., nesting in more northern latitudes and wintering in more southern latitudes (Billerman et al. 2020). Soras nest once a year in northern latitudes and migrate south during the nonbreeding season (Billerman et al. 2020). Sora can be observed year-round in wetlands, upland fields, roads, and airport runways (Rottenborn and Brinkley 2007, Billerman et al. 2020).

According to BBS trend data, populations in the Eastern BBS survey region have decreased 0.73% annually from 1966-2015, and 3.31% annually from 2005-2015 (Sauer et al. 2017). No trend data from the BBS in Virginia is available (Sauer et al. 2017). The number of soras observed in the Commonwealth during the CBC has shown a declining trend since 1966 (National Audubon Society 2010). There are no sora population estimates available for Virginia. However, Wires et al. (2010) estimated that 2,380 to 13,240 individuals reside in BCR 12 and 7,000 to 13,300 reside in BCR 13 during the breeding season. Although none of Virginia falls within BCR 12 or 13, regions which encompass the Great Lakes and Saint Laurence River, birds which breed in these regions are likely the same birds which can be observed wintering in Virginia.

Although lethal removal was authorized, no soras or active sora nests were lethally removed by WS or other entities to alleviate damage and threats in Virginia from 2011 to 2017. WS did not disperse any soras from 2011 to 2017 to alleviate damage and threats. Soras can be harvested during a regulated harvest season. Because the number of soras harvested by hunters in Virginia is unavailable, the number of soras harvested by hunters in the Atlantic Flyway from 2011 to 2017 is presented in Table 3.9.

Table 3.9 – Number of soras harvested in Virginia from 2011 to 2017

Year	Hunter Harvest[ab]
2011	1,900
2012	2,100
2013	1,700
2014	1,400
2015	3,800
2016	1,600
2017	1,300
AVERAGE	**1,971**

[a]In Atlantic Flyway. No estimates are available for Virginia.
[b]Raftovich and Wilkins 2013, Raftovich et al. 2015, Raftovich et al. 2017, and Raftovich et al. 2018

Direct, Indirect, and Cumulative Effects:
In anticipation of requests for assistance, WS could lethally remove up to 20 soras and remove or destroy up to 20 active sora nests annually under the proposed action / no action alternative to manage damage or threats of damage.

Based on the best available information, the lethal removal of up to 20 soras annually by WS would represent 1.0% of the average number of soras harvested by hunters in Virginia. Alternatively, it would represent 0.2% to 0.08% of the estimated population in BCR 12 and 13 (9,380 to 26,540). If average annual hunter harvest remains the same, annual cumulative removal by all entities under the proposed action alternative could be estimated at 1,991 birds (20 birds by WS, 1,971 birds by hunters). This is equivalent to 21.2 to 7.5% of the estimated population in BCR 12 and 13. WS' lethal removal would be a limited component of the overall lethal removal occurring and should not have any significant direct or cumulative impact on sora populations. WS anticipates requests to address sora from airports. Airports are restricted areas where hunting is not permitted. Therefore, WS' lethal removal of soras is likely to occur in locations where it will not limit the ability to harvest soras. WS' lethal removal would be a limited component of the overall harvest and could be considered of low magnitude when compared to the number of soras being harvested and lethally removed. Lethal removal can only occur at the discretion of the USFWS and harvest can only occur within regulations established by USFWS in cooperation with VDWR. These entities ensure activities occur to achieve desired population objectives. WS would report the number of sora lethally removed annually to the USFWS and the VDWR.

Additionally, impacts due to the destruction of active nests should have little adverse impact on the sora population. Many bird species can identify areas with regular human disturbance and low reproductive success, relocating and nesting elsewhere when confronted with repeated nest failure. Although there may be reduced fecundity for the individuals affected by nest and egg destruction, this activity has no long-term effect on breeding adult birds. This method is used by WS to inhibit nesting in an area experiencing damage due to nesting activity and is employed only at the localized level. The destruction of up to 20 active sora nests annually by WS would occur in localized areas where nesting takes place and would not reach a level where adverse effects on sora populations would occur. As with the lethal removal of birds, the removal of active nests must be authorized by the USFWS. Therefore, the number of active nests removed by WS annually would occur at the discretion of the USFWS.

Sandhill Crane Population Impact Analysis

Sandhill cranes can be observed in freshwater wetlands, open grasslands and agricultural lands across much of the U.S. (Billerman et al. 2020). In Virginia, the number of records of these birds has increased and observations made in 2016 during the Virginia Breeding Bird Atlas indicate that breeding may now

be occurring in the state (Rottenborn and Brinkley 2007, Peele 2016). In fact, the eastern population of sandhill cranes is expanding in both size and range (Dubovsky 2017). Birds generally nest once a year (but can nest up to 3 times per year) in more northern latitudes and winter in more southern latitudes (Billerman et al. 2020). Social birds, sandhill cranes are often observed in flocks (Billerman et al. 2020). Flock sizes vary considerably from 16 to more than 100 birds (Johnsgard 1983).

According to BBS trend data, populations in the Eastern BBS survey region have increased 6.03% annually from 1966-2015, and 8.13% annually from 2005-2015 (Sauer et al. 2017). No trend data from the BBS in Virginia is available (Sauer et al. 2017). The number of sandhill cranes observed in the Commonwealth during the CBC has shown an increasing trend since 1966 (National Audubon Society 2010). Similarly, an annual fall index survey conducted by USFWS indicates a long-term increasing trend in the eastern population of sandhill cranes with an average population growth rate of 3.9% per year from 1979 to 2009 with more recent data indicating the growth rate has increased to 4.4% per year (Dubovsky 2017). There are no sandhill crane population estimates available for Virginia. However, the annual fall index survey of the eastern population sandhill cranes conducted by USFWS can be used to reasonably represent a population estimate (95,403 birds in 2016) (Dubovsky 2017). It should be noted that research indicates that a portion of the population is unavailable to be counted during this survey and therefore this figure is 20-30% lower than it would be if all birds could be counted (Dubovsky 2017).

Although lethal removal was authorized, no sandhill cranes or active sandhill crane nests were lethally removed by WS or other entities to alleviate damage and threats in Virginia from 2011 to 2017. WS did not disperse any Sandhill cranes from 2011 to 2017 to alleviate damage and threats. There is no regulated harvest season for sandhill cranes in Virginia. However, it should be noted that sandhill cranes can be harvested in adjacent states (Kentucky and Tennessee) (Dubovsky 2017).

Direct, Indirect, and Cumulative Effects:
Based on previous requests for assistance and in anticipation of an increase in the number of requests for assistance, WS could lethally remove up to 20 sandhill cranes and remove or destroy up to 20 active sandhill crane nests annually under the proposed action / no action alternative to manage damage or threats of damage.

Based on the best available information, the lethal removal of up to 20 sandhill cranes annually by WS would represent 0.02% of the estimated population of sandhill cranes in the eastern population (95,403). From 2011 to 2017, no sandhill cranes were lethally removed in the Commonwealth. If this lethal removal is reflective of future lethal removal by *other* entities, the annual cumulative lethal removal by *all* entities under the proposed action alternative could be estimated at 20 birds. Given the limited magnitude of lethal removal proposed by WS when compared to the estimated population, WS' proposed lethal removal should not have any significant direct or cumulative impact on sandhill crane populations. Lethal removal of sandhill cranes can only occur at the discretion of the USFWS. The USFWS ensures lethal removal occurs to achieve desired objectives. WS would report the number of sandhill cranes lethally removed annually to the USFWS.

Additionally, impacts due to the destruction of active nests should have little adverse impact on the sandhill crane population. Many bird species can identify areas with regular human disturbance and low reproductive success, relocating and nesting elsewhere when confronted with repeated nest failure. Although there may be reduced fecundity for the individuals affected by nest and egg destruction, this activity has no long-term effect on breeding adult birds. This method is used by WS to inhibit nesting in an area experiencing damage due to nesting activity and is employed only at the localized level. The destruction of up to 20 active sandhill crane nests annually by WS would occur in localized areas where nesting takes place and would not reach a level where adverse effects on sandhill crane populations would occur. As with the lethal removal of birds, the removal of active nests must be authorized by the USFWS.

Therefore, the number of active nests removed by WS annually would occur at the discretion of the USFWS.

Upland Sandpiper Population Impact Analysis

Unlike most shorebirds, upland sandpipers are not associated with coastal or wetland habitats (Billerman et al. 2020). They can be observed across much of the U.S. and Canada in grassland habitat including pasture, moist meadows, airports, agricultural lands, and highway rights-of-way (Billerman et al. 2020). In Virginia, these birds can be observed during the breeding season (Terwilliger 1991). Birds nest once per year in loose colonies and feed, rest and fly in groups, forming flocks of up to 25 individuals (Billerman et al. 2020).

According to BBS trend data, populations in the Eastern BBS survey region have decreased 4.13% annually from 1966-2015, and 2.05% annually from 2005-2015 (Sauer et al. 2017). No trend data from the BBS in Virginia is available (Sauer et al. 2017). There is no CBC trend data available for Virginia (National Audubon Society 2010) nor is there a state population estimate for this species. The North American population of upland sandpipers has most recently been estimated at 750,000 birds (Andres et al. 2012). These birds are included on USFWS's regional list of bird species of concern (Appendix D).

Upland sandpipers were removed from the Virginia Endangered and Threatened Species List in 2015. Rationale for delisting upland sandpiper was, "1. this species was not historically abundant, 2. [it] occurs in Virginia largely due to artificial habitat creation [sod farms and airports], and 3. [it] is on the extreme south-eastern edge of the species range" (A. Ewing, VDWR, personal communication, 2018).

Although lethal removal was authorized, no upland sandpipers or active upland sandpiper nests were lethally removed by WS or other entities to alleviate damage and threats in Virginia from 2011 to 2017. WS dispersed an average of 2 upland sandpipers on an annual basis during this time.

Direct, Indirect, and Cumulative Effects:
Based on previous requests for assistance and in anticipation of an increase in the number of requests for assistance, WS could lethally remove up to 10 upland sandpipers and remove or destroy up to 10 active upland sandpiper nests annually under the proposed action / no action alternative to manage damage or threats of damage.

Based on the best available information, the lethal removal of up to 10 upland sandpiper annually by WS would represent 0.001% of the North American population (750,000 birds). From 2011 to 2017, no upland sandpipers were lethally removed in the Commonwealth. If this lethal removal is reflective of future lethal removal by *other* entities, the annual cumulative lethal removal by *all* entities under the proposed action alternative could be estimated at 10 birds. Given the limited magnitude of lethal removal proposed by WS when compared to the estimated population, WS' proposed lethal removal should not have any significant direct or cumulative impact on upland sandpiper populations. Lethal removal of upland sandpipers can only occur at the discretion of the USFWS. The USFWS ensures lethal removal occurs to achieve desired objectives. WS would report the number of upland sandpipers lethally removed annually to the USFWS.

Additionally, impacts due to the destruction of active nests should have little adverse impact on the upland sandpiper population. Many bird species can identify areas with regular human disturbance and low reproductive success, relocating and nesting elsewhere when confronted with repeated nest failure. Although there may be reduced fecundity for the individuals affected by nest and egg destruction, this activity has no long-term effect on breeding adult birds. This method is used by WS to inhibit nesting in an area experiencing damage due to nesting activity and is employed only at the localized level. The

destruction of up to 10 active upland sandpiper nests annually by WS would occur in localized areas where nesting takes place and would not reach a level where adverse effects on upland sandpiper populations would occur. As with the lethal removal of birds, the removal of active nests must be authorized by the USFWS. Therefore, the number of active nests removed by WS annually would occur at the discretion of the USFWS.

Whimbrel Population Impact Analysis

Whimbrels nest in the arctic, migrating south to winter along the Atlantic, Pacific and Gulf coasts (Billerman et al. 2020). In Virginia, whimbrels can be observed primarily during April and May as well as July through September, in meadows, fields, and coastal areas (Billerman et al. 2020, Rottenborn and Brinkley 2007). Birds nest once per year and form flocks during the non-breeding season (Billerman et al. 2020). A peak count of more than 41,000 of these birds was made during an aerial survey of the Commonwealth's Eastern Shore in May of 1995 (Rottenborn and Brinkley 2007).

Because they are arctic breeders, no BBS data on whimbrels is available (Sauer et al. 2017). The number of whimbrels observed in the Commonwealth during the CBC has shown a declining trend since 1966 (National Audubon Society 2010). Peak numbers of migrant whimbrels in Virginia declined between 1994 and 2009 (Watts and Truitt 2011) but no other population information for Wimbrels in Virginia is available. The North American population of whimbrels has most recently been estimated at 80,000 birds with the population wintering along the Atlantic and Gulf coasts estimated at 40,000 birds (Andres et al. 2012). These birds are included on USFWS's regional list of bird species of concern (Appendix D).

Although lethal removal was authorized, no whimbrels or active whimbrel nests (these birds are arctic breeders) were lethally removed by WS or other entities to alleviate damage and threats in Virginia from 2011 to 2017. WS did not disperse any whimbrels during this period.

Direct, Indirect, and Cumulative Effects:
Based on previous requests for assistance and in anticipation of an increase in the number of requests for assistance, WS could lethally remove up to 10 whimbrels annually under the proposed action / no action alternative to manage damage or threats of damage.

Based on the best available information, the lethal removal of up to 10 whimbrel annually by WS would represent 0.01% of the North American population (80,000 birds) and 0.03% of the population that winters along the Atlantic and Gulf coasts (40,000 birds). From 2011 to 2017, no whimbrels were lethally removed in the Commonwealth. If this lethal removal is reflective of future lethal removal by *other* entities, the annual cumulative lethal removal by *all* entities under the proposed action alternative could be estimated at 10 birds. Given the limited magnitude of lethal removal proposed by WS when compared to the estimated population, WS' proposed lethal removal should not have any significant direct or cumulative impact on whimbrel populations. Lethal removal of whimbrels can only occur at the discretion of the USFWS. The USFWS ensures lethal removal occurs to achieve desired objectives. WS would report the number of whimbrels lethally removed annually to the USFWS.

Sanderling Population Impact Analysis

Observed across the plain states during migration and along the Atlantic, Pacific and Gulf coasts during the non-breeding seasons, sanderlings can be observed on sandy beaches, tidal mudflats, rocky coastlines and the shores of lakes and rivers (Billerman et al. 2020). Sanderlings nest in the arctic, generally raising one clutch per year (Billerman et al. 2020). Highly social, sanderlings are generally found in flocks (5 to 2,500 birds), sometimes with other shorebirds, during the non-breeding season (Billerman et al. 2020).

Peak counts of these birds in the Commonwealth have exceeded 16,000 individuals (Rottenborn and Brinkley 2007).

No BBS trend data is available for sanderlings because they are arctic breeders (Sauer et al. 2017). The number of sanderlings observed in the Commonwealth during the CBC has shown a declining trend since 1966 (National Audubon Society 2010). No population estimates for these birds in the Commonwealth or region is available. The sanderling population in North America is estimated at 300,000 birds (Andres et al. 2002).

The number of sanderlings lethally removed by WS or other entities to alleviate damage and threats in Virginia from 2011 to 2017 is shown in Table 3.10. No active sanderling nests were destroyed during this time (these birds are arctic breeders). WS dispersed an average of 5,885 sanderlings on an annual basis from 2011 to 2017 to alleviate damage and threats.

Table 3.10 – Number of sanderlings addressed in Virginia from 2011 to 2017

	Removal Under Depredation Permits		
Year	**Authorized Lethal Removal[a]**	**WS' Lethal Removal[bc]**	**Total Lethal Removal by All Entities[ad]**
2011	30	0	7
2012	30	7	0
2013	50	41	0
2014	210	0	0
2015	240	0	5
2016	240	5	0
2017	240	0	0
AVERAGE	**149**	**8**	**2**

[a]Data reported by calendar year, obtained from USFWS's Service Permit Issuance and Tracking System (SPITS) system, A. McCollum, USFWS, personal communication, 2018
[b]Data reported by federal fiscal year, obtained from WS' Management Information System (MIS) system
[c]WS' removal conducted under depredation permits issued to WS and other entities where WS is a subpermittee
[d]Includes WS' lethal removal as reported by USFWS's SPITS system

Direct, Indirect, and Cumulative Effects:
Based on previous requests for assistance and in anticipation of an increase in the number of requests for assistance, WS could lethally remove up to 150 sanderlings annually under the proposed action / no action alternative to manage damage or threats of damage.

Based on the best available information, the lethal removal of up to 150 sanderling annually by WS would represent 0.05% of the North American population (300,000). From 2011 to 2017, an average of two sanderlings were lethally removed on an annual basis by *all* entities in the Commonwealth. If this lethal removal is reflective of future lethal removal by *other* entities, the annual cumulative lethal removal by *all* entities under the proposed action alternative could be estimated at 152 birds (2 birds by other entities, 150 by WS). This is equivalent to 0.05% of the North American population. Given the limited magnitude of lethal removal proposed by WS when compared to the estimated population, WS' proposed lethal removal should not have any significant direct or cumulative impact on sanderling populations. Lethal removal of sanderlings can only occur at the discretion of the USFWS. The USFWS ensures lethal removal occurs to achieve desired objectives. WS would report the number of sanderlings lethally removed annually to the USFWS.

Semiplamated Sandpiper Population Impact Analysis

Semipalmated sandpipers breed in the arctic, migrating south across much of the U.S. to winter in in the Caribbean and points south (Billerman et al. 2020). Preferred habitat includes areas of shallow fresh or salt water, intertidal zones, wetlands, and beaches (Billerman et al. 2020). These birds are often observed in large flocks of up to several thousand birds during the nonbreeding season (Billerman et al. 2020). In the Commonwealth, peak counts of 50,000 of these birds have been documented (Rottenborn and Brinkley 2007).

No BBS trend data is available for semipalmated sandpipers because they arctic breeders (Sauer et al. 2017). The number of semipalmated sandpipers observed in the Commonwealth during the CBC has shown a declining trend since 1966 (National Audubon Society 2010). No statewide or regional population estimates for these birds are available. The semipalmated sandpiper population in North America is estimated at 2,260,000 birds (Andres et al. 2002). These birds are included on USFWS's regional list of bird species of concern (Appendix D).

Although lethal removal was authorized, no semipalmated sandpipers or active semipalmated sandpiper nests (these birds are arctic breeders) were lethally removed by WS or other entities to alleviate damage and threats in Virginia from 2011 to 2017. WS did not disperse any semipalmated sandpipers during this period.

Direct, Indirect, and Cumulative Effects:
Based on previous requests for assistance and in anticipation of an increase in the number of requests for assistance, WS could lethally remove up to 20 semipalmated sandpipers annually under the proposed action / no action alternative to manage damage or threats of damage.

Based on the best available information, the lethal removal of up to 20 semipalmated sandpiper annually by WS would represent 0.0009% of the North American population (2,260,000 birds). From 2011 to 2017, no semipalmated sandpipers were lethally removed in the Commonwealth. If this lethal removal is reflective of future lethal removal by *other* entities, the annual cumulative lethal removal by *all* entities under the proposed action alternative could be estimated at 20 birds. Given the limited magnitude of lethal removal proposed by WS when compared to the estimated population, WS' proposed lethal removal should not have any significant direct or cumulative impact on semipalmated sandpiper populations. Lethal removal of semipalmated sandpipers can only occur at the discretion of the USFWS. The USFWS ensures lethal removal occurs to achieve desired objectives. WS would report the number of semipalmated sandpipers lethally removed annually to the USFWS.

Short-billed Dowitcher Population Impact Analysis

An arctic nesting shorebird, short-billed dowitchers can be observed across much of the U.S. during migration and along the Atlantic, Pacific and Gulf coasts during the non-breeding season (Billerman et al. 2020). In Virginia, short-billed dowitchers can be observed primarily from March through June and again from July through October, in coastal areas including tidal flats, beaches and salt marshes (Billerman et al. 2020, Rottenborn and Brinkley 2007). Birds nest once per year and form large dense flocks during the non-breeding season (Billerman et al. 2020). Recent (2003) peak counts of more than 3,000 of these birds have been made on the Commonwealth's Eastern Shore (Rottenborn and Brinkley 2007). Historic peak counts (1972) are much higher (10,000 birds) (Rottenborn and Brinkley 2007).

Because they are arctic breeders, no BBS data on short-billed dowitchers is available (Sauer et al. 2017). The number of short-billed dowitchers observed in the Commonwealth during the CBC has shown an increasing trend since 1966 (National Audubon Society 2010). No state or regional population estimates

for these birds is available. The population of short-billed dowitchers in North America has most recently been estimated at 153,000 birds (Andres et al. 2012). These birds are included on USFWS's regional list of bird species of concern (Appendix D).

Although lethal removal was authorized, no short-billed dowitchers were lethally removed by WS or other entities to alleviate damage and threats in Virginia from 2011 to 2017. No active short-billed dowitchers nests were destroyed during this time (these birds are arctic breeders). WS did not disperse any short-billed dowitchers during this period.

Direct, Indirect, and Cumulative Effects:
Based on previous requests for assistance and in anticipation of an increase in the number of requests for assistance, WS could lethally remove up to 10 short-billed dowitchers annually under the proposed action / no action alternative to manage damage or threats of damage.

Based on the best available information, the lethal removal of up to 10 short-billed dowitcher annually by WS would represent 0.006% of the North American population (153,000 birds). From 2011 to 2017, no short-billed dowitchers were lethally removed in the Commonwealth. If this lethal removal is reflective of future lethal removal by *other* entities, the annual cumulative lethal removal by *all* entities under the proposed action alternative could be estimated at 10 birds. Given the limited magnitude of lethal removal proposed by WS when compared to the estimated population, WS' proposed lethal removal should not have any significant direct or cumulative impact on short-billed dowitcher populations. Lethal removal of short-billed dowitchers can only occur at the discretion of the USFWS. The USFWS ensures lethal removal occurs to achieve desired objectives. WS would report the number of short-billed dowitchers lethally removed annually to the USFWS.

American Woodcock Population Impact Analysis

American woodcock are a migratory gamebird which can be observed across the eastern U.S. (Billerman et al. 2020). In eastern portions of the Commonwealth, American woodcock can be observed year-round while in western portions of the state they can only be observed during the breeding season (Billerman et al. 2020). American woodcock prefer young forest and abandoned farmland, forest openings and old fields (Billerman et al. 2020). These birds nest once a year and are usually solitary, with small and temporary aggregations occurring during mating when loosely clustered displaying males attract females (McCauley et al. 2013). Aggregations also occur during migration, a peak count of 570 individuals was made in 1993 in the Commonwealth's coastal plain (Rottenborn and Brinkley 2007).

Trend data from the Virginia BBS from 1966-2015, and 2005-2015 indicates that American woodcock populations have declined at an annual rate of 1.97% and 1.93% respectively (Sauer et al. 2017). Similarly, surveys of singing male American woodcock from 1968 to 2018 and 2008 to 2018 indicate a declining trend regionally and in the state (USFWS / Seamans and Rau 2018). In contrast, trend data from the Commonwealth's CBC indicates that American woodcock populations have increased since 1966 (National Audubon Society 2010). No population estimates are available for the Commonwealth or region. The North American population of American woodcock has been estimated at 3,500,000 birds (Andres et al. 2012).

Although lethal removal was authorized, no American woodcocks or active American woodcock nests were lethally removed by WS from 2011 to 2017. WS did not disperse American woodcocks during this period. American woodcock can be harvested during a regulated harvest season. The number of American woodcock harvested by hunters from 2011 to 2017 is shown in Table 3.11.

Table 3.11 - Number of American woodcock harvested by hunters in Virginia from 2011 to 2017.

Year	Hunter Harvest[a]
2011	2,500
2012	1,200
2013	5,700
2014	1,900
2015	3,200
2016	1,900
2017	3,400
AVERAGE	**2,829**

[a]Raftovich and Wilkins 2013, Raftovich et al. 2015, Raftovich et al. 2017, and Raftovich et al. 2018

Direct, Indirect, and Cumulative Effects:
In anticipation of an increase in the number of requests for assistance, WS could lethally remove up to 50 American woodcock and remove or destroy up to 20 active American woodcock nests annually under the proposed action / no action alternative to manage damage or threats of damage.

The lethal removal of up to 50 American woodcock annually by WS would represent 1.8% of the average number of American woodcocks harvested by hunters in Virginia from 2011 to 2017 (2,829 birds). Alternatively, it would represent 0.001% of the estimated North American population (3,500,000 birds). If average annual hunter harvest remains the same, annual cumulative removal by all entities under the proposed action alternative could be estimated at 2,879 birds (50 birds by WS, 2,829 birds by hunters). This is equivalent to 0.08% of the estimated population in North America. WS' lethal removal would be a limited component of the overall lethal removal occurring and should not have any significant direct or cumulative impact on American woodcock populations. Most requests received by WS to address American woodcocks are likely to be received from airports. Airports are restricted areas where hunting is not permitted. Therefore, WS' lethal removal of American woodcocks is likely to occur in locations where it will not limit the ability to harvest American woodcocks. WS' lethal removal would be a limited component of the overall harvest and could be considered of low magnitude when compared to the number of American woodcocks being harvested. Lethal removal can only occur at the discretion of the USFWS and harvest can only occur within regulations established by USFWS in cooperation with VDWR. These entities ensure activities occur to achieve desired population objectives. WS would report the number of American woodcock lethally removed annually to the USFWS and the VDWR.

Additionally, impacts due to the destruction of active nests should have little adverse impact on the American woodcock population. Many bird species can identify areas with regular human disturbance and low reproductive success, relocating and nesting elsewhere when confronted with repeated nest failure. Although there may be reduced fecundity for the individuals affected by nest and egg destruction, this activity has no long-term effect on breeding adult birds. This method is used by WS to inhibit nesting in an area experiencing damage due to nesting activity and is employed only at the localized level. The destruction of up to 20 active American woodcock nests annually by WS would occur in localized areas where nesting takes place and would not reach a level where adverse effects on American woodcock populations would occur. As with the lethal removal of birds, the removal of active nests must be authorized by the VDWR.

Wilson's Snipe Population Impact Analysis

Wilson's snipe are a migratory gamebird which can be observed across the U.S. (Billerman et al. 2020). It can be observed in Virginia in wet meadows, wet pastures and wetlands during the nonbreeding season (Billerman et al. 2020). These birds nest once a year and are usually solitary but will congregate in small

flocks (Billerman et al. 2020). Peak counts of more than 100 individuals have been made on numerous occasions in the Commonwealth (Rottenborn and Brinkley 2007).

According to BBS trend data, populations in the Eastern BBS survey region have decreased 0.04% annually from 1966-2015 but increased 0.44% annually from 2005-2015 (Sauer et al. 2017). No trend data from the BBS in Virginia is available (Sauer et al. 2017). Trend data from the Commonwealth's CBC indicates that Wilson's snipe populations have declined since 1966 (National Audubon Society 2010). The Commonwealth's population is unknown. The North American population of Wilson's snipe is estimated at two million birds (Andres et al. 2012).

The number of Wilson's snipe lethally removed by WS or other entities to alleviate damage and threats in Virginia from 2011 to 2017 is shown in Table 3.12. No active Wilson's snipe nests were destroyed during this time period (these birds are arctic breeders). WS used nonlethal methods to disperse an average of 39 Wilson's snipes per year from 2011 to 2017. Wilson's snipe can be harvested during a regulated harvest season. The number of Wilson's snipe harvested by hunters from 2011 to 2017 is shown in Table 3.12.

Table 3.12 - Number of Wilson's snipe addressed in Virginia from 2011 to 2017.

	Removal Under Depredation Permits			
Year	**Authorized Lethal Removal[a]**	**WS' Lethal Removal[bc]**	**Total Lethal Removal by All Entities[ad]**	**Hunter Harvest[e]**
2011	30	3	0	1,400
2012	30	0	2	1,000
2013	50	3	0	1,700
2014	50	1	0	1,000
2015	60	2	0	900
2016	60	0	0	100
2017	60	0	1	50
AVERAGE	**49**	**1**	**<1**	**879**

[a]Data reported by calendar year, obtained from USFWS's Service Permit Issuance and Tracking System (SPITS) system, A. McCollum, USFWS, personal communication, 2018
[b]Data reported by federal fiscal year, obtained from WS' Management Information System (MIS) system
[c]WS' removal conducted under depredation permits issued to WS and other entities where WS is a subpermittee
[d]Includes WS' lethal removal as reported by USFWS's SPITS system
[e]Raftovich and Wilkins 2013, Raftovich et al. 2015, Raftovich et al. 2017, and Raftovich et al. 2018

Direct, Indirect, and Cumulative Effects:
Based on previous requests for assistance and in anticipation of an increase in the number of requests for assistance, WS could lethally remove up to 50 Wilson's snipe annually under the proposed action / no action alternative to manage damage or threats of damage.

The lethal removal of up to 50 Wilson's snipe annually by WS would represent 5.7% of the average number of Wilson's snipes harvested by hunters in Virginia from 2011 to 2017 (879 birds). Alternatively, it would represent 0.003% of the estimated North American population (2,000,000 birds). From 2011 to 2017, an average of <1 Wilson's snipe were lethally removed on an annual basis by *all* entities in the Commonwealth. If this lethal removal is reflective of future lethal removal by *other* entities, and average annual hunter harvest remains the same, the annual cumulative lethal removal by *all* entities under the proposed action alternative could be estimated at 930 birds (1 bird by other entities, 50 by WS, 879 by hunters). This is equivalent to 0.003% of the estimated population in North America. WS' lethal removal would be a limited component of the overall lethal removal occurring and should not

have any significant direct or cumulative impact on Wilson's snipe populations. Most requests received by WS to address Wilson's snipes are received from airports. Airports are restricted areas where hunting is not permitted. Therefore, WS' lethal removal of Wilson's snipes is likely to occur in locations where it will not limit the ability to harvest Wilson's snipes. WS' lethal removal would be a limited component of the overall harvest and could be considered of low magnitude when compared to the number of Wilson's snipes being harvested. Lethal removal can only occur at the discretion of the USFWS and harvest can only occur within regulations established by USFWS in cooperation with VDWR. These entities ensure activities occur to achieve desired population objectives. WS would report the number of Wilson's snipe lethally removed annually to the USFWS and the VDWR.

Greater Yellowlegs Population Impact Analysis

Nesting in Canada, these birds can be observed across the U.S. during migration and along the Atlantic, Pacific and Gulf Coasts during the non-breeding season (Billerman et al. 2020). Preferred habitat includes freshwater, brackish and saltwater wetlands; cobble, sand or mud flats; grassy meadows, flooded agricultural fields, temporarily flooded areas and sewage ponds (Billerman et al. 2020). Greater yellowlegs form small flocks during migration and may be associated with other shorebirds (Billerman et al. 2020). Peak counts of 1,100 of these birds have been made along the Commonwealth's Eastern Shore (Rottenborn and Brinkley 2007).

According to BBS trend data, greater yellow legs populations in the Eastern BBS survey region have increased 4.76% annually from 1966-2015, and 10.1% annually from 2005-2015 (Sauer et al. 2017). Similarly, the number of greater yellowlegs observed in the Commonwealth during the CBC has shown an increasing trend since 1966 (National Audubon Society 2010). No population estimates for the Commonwealth or region are available. The North American population of greater yellowlegs has most recently been estimated at 137,000 birds and data sources indicate a stable to increasing trend (Andres et al. 2012).

The number of greater yellowlegs lethally removed by WS or other entities to alleviate damage and threats in Virginia from 2011 to 2017 is shown in Table 3.13. No active greater yellowlegs nests were destroyed during this time (these birds don't breed in Virginia). WS dispersed an average of 276 greater yellowlegs on an annual basis from 2011 to 2017 to alleviate damage and threats.

Table 3.13 – Number of greater yellowlegs addressed in Virginia from 2011 to 2017

	Removal Under Depredation Permits		
Year	Authorized Lethal Removal[a]	WS' Lethal Removal[bc]	Total Lethal Removal by All Entities[ad]
2011	20	1	0
2012	20	1	0
2013	20	1	1
2014	50	0	0
2015	50	0	0
2016	50	0	0
2017	50	0	0
AVERAGE	**37**	**<1**	**<1**

[a]Data reported by calendar year, obtained from USFWS's Service Permit Issuance and Tracking System (SPITS) system, A. McCollum, USFWS, personal communication, 2018
[b]Data reported by federal fiscal year, obtained from WS' Management Information System (MIS) system
[c]WS' removal conducted under depredation permits issued to WS and other entities where WS is a subpermittee
[d]Includes WS' lethal removal as reported by USFWS's SPITS system

Direct, Indirect, and Cumulative Effects:
Based on previous requests for assistance and in anticipation of an increase in the number of requests for assistance, WS could lethally remove up to 75 greater yellowlegs annually under the proposed action / no action alternative to manage damage or threats of damage.

Based on the best available information, the lethal removal of up to 75 greater yellowlegs annually by WS would represent 0.005% of the North American population (137,000 birds). From 2011 to 2017, less than 1 greater yellowlegs was lethally removed on an annual basis by *all* entities in the Commonwealth. If this lethal removal is reflective of future lethal removal by *other* entities, the annual cumulative lethal removal by *all* entities under the proposed action alternative could be estimated at 76 birds (1 bird by other entities, 75 by WS). This is equivalent to 0.06% of the North American population. Given the limited magnitude of lethal removal proposed by WS when compared to the estimated population, WS' proposed lethal removal should not have any significant direct or cumulative impact on greater yellowlegs populations. Lethal removal of greater yellowlegs can only occur at the discretion of the USFWS. The USFWS ensures lethal removal occurs to achieve desired objectives. WS would report the number of greater yellowlegs lethally removed annually to the USFWS.

Lesser Yellowlegs Population Impact Analysis

Lesser yellowlegs can be observed across the U.S. and Canada including Virginia during migration and along the Atlantic, Pacific and Gulf Coasts during the non-breeding season (Billerman et al. 2020). Preferred habitat includes freshwater, brackish and saltwater wetlands, sandbars, mudflats, riverbanks, and flooded agricultural fields (Billerman et al. 2020). Birds nest once per year in Canada (Billerman et al. 2020). Lesser yellowlegs form flocks during the non-breeding season (Billerman et al. 2020). Peak counts of 3,000 of these birds have been made along the Commonwealth's Eastern Shore (Rottenborn and Brinkley 2007).

According to BBS trend data, lesser yellow legs populations in the Eastern BBS survey region have declined 2.01% annually from 1966-2015 and increased 2.41% annually from 2005-2015 (Sauer et al. 2017). Similarly, the number of lesser yellowlegs observed in the Commonwealth during the CBC has shown a declining trend since 1966 (National Audubon Society 2010). No population estimates for the Commonwealth or region are available. The North American population of lesser yellowlegs has most recently been estimated at 660,000 birds and data sources indicate a decline (Andres et al. 2012). These birds are included on USFWS's regional list of bird species of concern (Appendix D).

The number of lesser yellowlegs lethally removed by WS or other entities to alleviate damage and threats in Virginia from 2011 to 2017 is shown in Table 3.14. No active lesser yellowlegs nests were destroyed during this time (these birds don't breed in Virginia). WS dispersed an average of 18 lesser yellowlegs on an annual basis from 2011 to 2017 to alleviate damage and threats.

Table 3.14 – Number of lesser yellowlegs addressed in Virginia from 2011 to 2017

Year	Removal Under Depredation Permits		
	Authorized Lethal Removal[a]	WS' Lethal Removal[bc]	Total Lethal Removal by All Entities[ad]
2011	30	0	0
2012	30	2	0
2013	30	0	4
2014	60	0	0
2015	70	0	0
2016	70	0	0
2017	70	0	0
AVERAGE	**51**	**<1**	**<1**

[a]Data reported by calendar year, obtained from USFWS's Service Permit Issuance and Tracking System (SPITS) system, A. McCollum, USFWS, personal communication, 2018
[b]Data reported by federal fiscal year, obtained from WS' Management Information System (MIS) system
[c]WS' removal conducted under depredation permits issued to WS and other entities where WS is a subpermittee
[d]Includes WS' lethal removal as reported by USFWS's SPITS system

Direct, Indirect, and Cumulative Effects:
Based on previous requests for assistance and in anticipation of an increase in the number of requests for assistance, WS could lethally remove up to 50 lesser yellowlegs annually under the proposed action / no action alternative to manage damage or threats of damage.

Based on the best available information, the lethal removal of up to 50 lesser yellowlegs annually by WS would represent 0.008% of the North American population (660,000 birds). From 2011 to 2017, less than 1 lesser yellowlegs was lethally removed on an annual basis by *all* entities in the Commonwealth. If this lethal removal is reflective of future lethal removal by *other* entities, the annual cumulative lethal removal by *all* entities under the proposed action alternative could be estimated at 51 birds (1 bird by other entities, 50 by WS). This is equivalent to 0.008% of the North American population. Given the limited magnitude of lethal removal proposed by WS when compared to the estimated population, WS' proposed lethal removal should not have any significant direct or cumulative impact on lesser yellowlegs populations. Lethal removal of lesser yellowlegs can only occur at the discretion of the USFWS. The USFWS ensures lethal removal occurs to achieve desired objectives. WS would report the number of lesser yellowlegs lethally removed annually to the USFWS.

Bonaparte's Gull Population Impact Analysis

An arctic breeder, Bonaparte's gulls can be observed along the Atlantic, Pacific and Gulf coasts as well as along the Great Lakes and inland across the Southeastern U.S. during the non-breeding season (Billerman et al. 2020). Habitat during the non-breeding season includes both freshwater and saltwater environments as well as anthropogenic attractants such as sewage lagoons (Billerman et al. 2020). Like most gulls, Bonaparte's gulls are highly social. Bonaparte's gulls form flocks in the tens of thousands to migrate, roost and forage during the nonbreeding season (Billerman et al. 2020). In Virginia, these birds have been observed in flocks numbering up to 10,000 individuals in the spring and 14,000 individuals in the fall (Rottenborn and Brinkley 2007).

Because they are arctic breeders, no BBS data on Bonaparte's gulls is available (Sauer et al. 2017). The number of Bonaparte's gulls observed in the Commonwealth during the CBC has shown a declining trend since 1966 (National Audubon Society 2010). There are no population estimates for Bonaparte's gulls in the Commonwealth. Nisbet et al. (2013) estimates that during the non-breeding season, Bonaparte's gulls

located from the Bay of Fundy south to the Straits of Florida number in the low 100,000s. However, the MANEM Waterbird Conservation Plan estimates the North American population of Bonaparte's gulls to be approximately 255,000 to 525,000 gulls (MANEM 2006).

The number of Bonaparte's gulls lethally removed by WS or other entities to alleviate damage and threats in Virginia from 2011 to 2017 is shown in Table 3.15. No active Bonaparte's gull nests were destroyed during this time (these birds don't breed in Virginia). WS dispersed an average of 169 Bonaparte's gulls on an annual basis from 2011 to 2017 to alleviate damage and threats.

Table 3.15 – Number of Bonaparte's gulls addressed in Virginia from 2011 to 2017

	Removal Under Depredation Permits		
Year	Authorized Lethal Removal[a]	WS' Lethal Removal[bc]	Total Lethal Removal by All Entities[ad]
2011	177	58	0
2012	177	0	2
2013	177	2	0
2014	177	0	0
2015	185	0	0
2016	195	0	0
2017	214	0	19
AVERAGE	**186**	**9**	**3**

[a]Data reported by calendar year, obtained from USFWS's Service Permit Issuance and Tracking System (SPITS) system, A. McCollum, USFWS, personal communication, 2018
[b]Data reported by federal fiscal year, obtained from WS' Management Information System (MIS) system
[c]WS' removal conducted under depredation permits issued to WS and other entities where WS is a subpermittee
[d]Includes WS' lethal removal as reported by USFWS's SPITS system

Direct, Indirect, and Cumulative Effects:
Based on previous requests for assistance and in anticipation of an increase in the number of requests for assistance, WS could lethally remove up to 300 Bonaparte's gulls annually under the proposed action / no action alternative to manage damage or threats of damage.

Based on the best available information, the lethal removal of up to 300 Bonaparte's gulls annually by WS would represent 0.3% of a low estimate for the regional population (100,000 birds) and 0.1 to 0.06% of the North American population (255,000 to 525,000 gulls). From 2011 to 2017, 3 Bonaparte's gulls were lethally removed on an annual basis by *all* entities in the Commonwealth. If this lethal removal is reflective of future lethal removal by *other* entities, the annual cumulative lethal removal by *all* entities under the proposed action alternative could be estimated at 303 birds (3 birds by other entities, 300 by WS). This is equivalent to 0.3% of a low estimate for the regional population and 0.1 to 0.06% of the North American population. Given the limited magnitude of lethal removal proposed by WS when compared to the estimated population, WS' proposed lethal removal should not have any significant direct or cumulative impact on Bonaparte's gull populations. Lethal removal of Bonaparte's gulls can only occur at the discretion of the USFWS. The USFWS ensures lethal removal occurs to achieve desired objectives. WS would report the number of Bonaparte's gulls lethally removed annually to the USFWS.

Laughing Gull Population Impact Analysis

Laughing gulls can be found from Maine south along the Atlantic and Gulf coasts during the breeding season and from North Carolina south during the rest of the year (Billerman et al. 2020). During the breeding season, laughing gulls use coastal habitats such as salt marshes; rocky, vegetated and sandy

islands with patches of long grass for nesting (Billerman et al. 2020). These areas as well as inland areas (rivers) and anthropogenic attractants such as airports and landfills are used during migration and the non-breeding season (Billerman et al. 2020). Highly social birds, laughing gulls nest, feed and migrate in groups (Billerman et al. 2020). Peak counts of as many as 72,000 of these birds have been documented in the Commonwealth during migration (Rottenborn and Brinkley 2007).

According to BBS trend data, laughing gull populations in the Eastern BBS survey region have increased 11% annually from 1966-2015, and 25.9% annually from 2005-2015 (Sauer et al. 2017). The number of laughing gulls observed in the Commonwealth during the CBC has shown an increasing trend since 1966 (National Audubon Society 2010). Watts et al. (2019) estimated the Commonwealth's breeding population at 33,306 birds in 2018. The most recent observations indicate there are a minimum of 181,626 breeding individuals in the Atlantic Flyway (Table 3.16). These estimates do not include non-breeding individuals which may represent a substantial portion of the population (Kadlec and Drury 1968) and which congregate in areas where they may cause damage or threats to human health and safety. For example, during the breeding season (May) an average of 12,050 non-breeding laughing gulls were surveyed near a single landfill in Mooresville, Pennsylvania (J. Wood, USDA WS, unpublished data 2020). Kadlec and Drury (1968) estimated a 1 to 1 ratio of non-breeding to breeding herring gulls (there is no published information for laughing gull ratios). Using a conservative .32 to 1 ratio of non-breeding to breeding laughing gulls, because laughing gulls breed at an earlier age (three) than herring gulls (five) (Billerman et al. 2020), the number of non-breeding laughing gulls in Virginia and the Atlantic Flyway could be estimated at 10,658 and 58,120 individuals, respectively. Therefore, the total laughing gull population could be estimated at 43,964 birds in Virginia and 239,746 birds in the Atlantic Flyway.

Table 3.16– Breeding population estimate of laughing gulls nesting in the Atlantic Flyway.

State / Province	Estimate
Delaware	18,000[a]
Florida	49,000[b]
Georgia	200[b]
Maine	6,362[c]
Maryland	1,898[c]
Massachusetts	3,726[d]
New Jersey	36,926[c]
New York	4,802[c]
North Carolina	17,674[a]
South Carolina	9,732[e]
Virginia	33,306[f]
TOTAL	**181,626 birds**

[a]Z. Loman, University of Maine, unpublished data (Colonial Waterbird Database USGS), 2020. Delaware estimate 1995, North Carolina estimate 2017.
[b]C. Dwyer, USFWS, personal communication, 2020. Florida estimate average of 2011 to 2015, Georgia estimate 2015.
[c]C. Dwyer, USFWS, unpublished data, 2018. Maine, Maryland, New Jersey, New York estimates 2013.
[d]C. Dwyer, USFWS, personal communication, 2018. Massachusetts estimate 2013.
[e]Wilkinson 1997. South Carolina estimate 1995.
[f]Watts et al. 2019. Virginia estimate 2018.

The number of laughing gulls and active laughing gull nests lethally removed by WS and other entities to alleviate damage and threats in Virginia from 2011 to 2017 is shown in Table 3.1. WS dispersed an average of 473,095 laughing gulls on an annual basis from 2011 to 2017.

Table 3.17 – Number of laughing gulls addressed in Virginia from 2011 to 2017

Year	Removal Under Depredation Permits					
	Birds			Active Nests		
	Authorized Lethal Removal[a]	WS' Lethal Removal[bc]	Total Lethal Removal by All Entities[ad]	Authorized Lethal Removal[a]	WS' Lethal Removal[bc]	Total Lethal Removal by All Entities[ad]
2011	8,211	1,476	3,716	9,500	1,213	3,811
2012	8,275	826	894	9,500	3,686	1,947
2013	8,370	1,446	1,714	10,500	1,917	3,622
2014	8,915	1,276	2,198	10,500	3,377	3,407
2015	9,010	1,289	1,540	10,500	3,215	3,254
2016	9,060	1,595	1,360	10,500	3,234	3,913
2017	9,160	2,048	3,114	10,500	3,913	NA[e]
AVERAGE	**8,714**	**1,422**	**2,077**	**10,214**	**2,936**	**2,851**

[a]Data reported by calendar year, obtained from USFWS's Service Permit Issuance and Tracking System (SPITS) system, A. McCollum, USFWS, personal communication, 2018
[b]Data reported by federal fiscal year, obtained from WS' Management Information System (MIS) system
[c]WS' removal conducted under depredation permits issued to WS and other entities where WS is a subpermittee
[d]Includes WS' lethal removal as reported by USFWS's SPITS system
[e]SPITS data not available at time of publication

Direct, Indirect, and Cumulative Effects:
Based on previous requests for assistance and in anticipation of an increase in the number of requests for assistance, WS could lethally remove up to 3,000 laughing gulls and remove or destroy up to 500 active laughing gull nests annually under the proposed action / no action alternative to manage damage or threats of damage.

Based on the best available information, the lethal removal of up to 3,000 laughing gulls annually by WS would represent 6.8% of the estimated population in the state (43,964 birds), or 1.25% of the estimated total population along the Atlantic Flyway (239,746 birds). From 2011 to 2017, an average of 2,077 laughing gulls were lethally removed on an annual basis by *all* entities in the Commonwealth. If this lethal removal is reflective of future lethal removal by *other* entities, the annual cumulative lethal removal by *all* entities under the proposed action alternative could be estimated at 5,007 birds (2,007 birds by other entities, 3,000 by WS). This is equivalent to 11.3% of the estimated state population, or 2.1% of the estimated total population along the Atlantic Flyway. Given the magnitude of lethal removal proposed by WS when compared to the estimated breeding population, WS' proposed lethal removal should not have any significant direct or cumulative impact on laughing gull populations. Lethal removal of laughing gulls can only occur at the discretion of the USFWS. The USFWS ensures lethal removal occurs to achieve desired objectives. WS would report the number of laughing gulls lethally removed annually to the USFWS.

Additionally, impacts due to the destruction of active nests should have little adverse impact on the laughing gull population. Many bird species can identify areas with regular human disturbance and low reproductive success, relocating and nesting elsewhere when confronted with repeated nest failure. Although there may be reduced fecundity for the individuals affected by nest and egg destruction, this activity has no long-term effect on breeding adult birds. This method is used by WS to inhibit nesting in an area experiencing damage due to nesting activity and is employed only at the localized level. The destruction of up to 500 active laughing gull nests annually by WS would occur in localized areas where nesting takes place and would not reach a level where adverse effects on laughing gull populations would occur. As with the lethal removal of birds, the removal of active nests must be authorized by the USFWS.

Therefore, the number of active nests removed by WS annually would occur at the discretion of the USFWS.

Ring-billed Gull Population Impact Analysis

During the breeding season, breeding ring-billed gulls can be observed along the Great Lakes, St. Lawrence River and at other large bodies of freshwater in the northern U.S. and Canada (Billerman et al. 2020) while non-breeding birds can be observed in places farther south (e.g., Bucks County, PA, J. Wood, USDA WS, unpublished data, 2020). During the non-breeding season gulls can be observed across the U.S. (Billerman et al. 2020). Ring-billed gulls use freshwater and saltwater habitats as well as anthropogenic environments such as airports, landfills, agricultural areas, athletic fields and large parking lots (Billerman et al. 2020). Highly social birds, ring-billed gulls nest, feed and migrate in groups of as many as 160,000 individuals (Billerman et al. 2020). Peak counts of as many as 44,000 of these birds have been documented in the Commonwealth during the winter (Rottenborn and Brinkley 2007).

According to BBS trend data, ring-billed gull populations in the Eastern BBS survey region have increased 3.3% annually from 1966-2015, and 5.7% annually from 2005-2015 (Sauer et al. 2017). The number of ring-billed gulls observed in the Commonwealth during the CBC has shown an increasing trend since 1966 (National Audubon Society 2010). The most recent observations indicate there are a minimum of 975,986 breeding individuals nesting in areas that may be present in the Atlantic Flyway during the non-breeding season (surveys were not comprehensive) (Table 3.18). These estimates do not include non-breeding individuals which represent a substantial portion of the population (Kadlec and Drury 1968) and congregate in areas where they may cause damage or threats to human health and safety. Kadlec and Drury (1968) estimated a 1 to 1 ratio of non-breeding to breeding herring gulls (there is no published information for ring-billed gull ratios). Using a conservative .32 to 1 ratio of non-breeding to breeding laughing gulls, because ring-billed gulls breed at an earlier age (three) than herring gulls (five) (Billerman et al. 2020), the number of non-breeding ring-billed gulls that may be present in the Atlantic Flyway could be estimated at 312,315 individuals. Therefore, the total number of ring-billed gulls that may be present in the Atlantic Flyway could be estimated at 1,288,301 birds.

Table 3.18 Breeding population estimate of ring-billed gulls nesting in the Atlantic Flyway and nesting in areas of the Mississippi flyway that may be present in the Atlantic Flyway during the nonbreeding season.

Location	Estimate
Canandaigua Lake	400[a]
Detroit River	82,216[b]
Lake Champlain	25,344[c]
Lake Erie	126,392[b]
Lake Huron	276,934[b]
Lake Oneida	528[d]
Lake Ontario	333,780[b]
New Brunswick	9,702[d]
Newfoundland	13,732[d]
Niagara River	26,850[b]
Prince Edward	76[d]
St. Laurence River	47,622[b]
St. Mary's River	32,410[b]
TOTAL	**975,986 birds**

[a]C. Dwyer, USFWS, personal communication, 2020. Canandaigua Lake estimate 2012.
[b]R. Pierce, USFWS, personal communication, 2020. Figures include birds nesting in both Canada and the U.S. Due to the extent of areas needing to be censused, not all locations censused in the same year. Data from any given location only included once. Detroit River, Lake Erie, Lake Huron, Lake Ontario, Niagara River, St. Laurence River, St. Mary's river estimates 2007-2009, [c]Gobeille 2019. Lake Champlain estimate 2019.
[d]Z. Loman, University of Maine, unpublished data (Colonial Waterbird Database USGS), 2020. Due to the extent of areas needing to be censused, not all locations censused in the same year. Data from any given location only included once. Lake Oneida estimate 2016, New Brunswick estimate 2010, Newfoundland estimate 2015-2017, Prince Edward estimate 2014.

The number of ring-billed gulls and active ring-billed gull nests lethally removed by WS and other entities to alleviate damage and threats in Virginia from 2011 to 2017 is shown in Table 3.19. WS dispersed an average of 897,352 ring-billed gulls on an annual basis from 2011 to 2017.

Table 3.19 – Number of ring-billed gulls addressed in Virginia from 2011 to 2017

	Removal Under Depredation Permits		
Year	**Authorized Lethal Removal[a]**	**WS' Lethal Removal[bc]**	**Total Lethal Removal by All Entities[ad]**
2011	8,670	612	1,466
2012	8,695	203	882
2013	9,655	235	1,289
2014	9,820	542	1,393
2015	10,655	671	1,275
2016	10,705	389	947
2017	10,505	608	1,638
AVERAGE	**9,815**	466	**1,270**

[a]Data reported by calendar year, obtained from USFWS's Service Permit Issuance and Tracking System (SPITS) system, A. McCollum, USFWS, personal communication, 2018
[b]Data reported by federal fiscal year, obtained from WS' Management Information System (MIS) system
[c]WS' removal conducted under depredation permits issued to WS and other entities where WS is a subpermittee
[d]Includes WS' lethal removal as reported by USFWS's SPITS system

Direct, Indirect, and Cumulative Effects:
Based on previous requests for assistance and in anticipation of an increase in the number of requests for assistance, WS could lethally remove up to 2,000 ring-billed gulls annually under the proposed action / no action alternative to manage damage or threats of damage.

Based on the best available information, the lethal removal of up to 2,000 ring-billed gulls annually by WS would represent 0.15% of the estimated population that may be present in the Atlantic Flyway (1,228,301birds). From 2011 to 2017, an average of 1,270 ring-billed gulls were lethally removed on an annual basis by *all* entities in the Commonwealth. If this lethal removal is reflective of future lethal removal by *other* entities, the annual cumulative lethal removal by *all* entities under the proposed action alternative could be estimated at 3,270 birds (1,270 birds by other entities, 2,000 by WS). This is equivalent to 0.25% of the estimated population of individuals that may be present in the Atlantic Flyway. Given the magnitude of lethal removal proposed by WS when compared to the estimated population, WS' proposed lethal removal should not have any significant direct or cumulative impact on ring-billed gull populations. Lethal removal of ring-billed gulls can only occur at the discretion of the USFWS. The USFWS ensures lethal removal occurs to achieve desired objectives. WS would report the number of ring-billed gulls lethally removed annually to the USFWS.

Herring Gull Population Impact Analysis

A common gull, herring gulls can be observed across much of the U.S. (Billerman et al. 2020). During the breeding season, herring gulls use a variety of natural (islands, marshes etc.) and anthropogenic sites (navigation markers, flat roofs etc.) adjacent to freshwater and saltwater habitats for nesting (Billerman et al. 2020). These areas, as well as inland areas (rivers) and other bodies of water that remain unfrozen and anthropogenic attractants such as urban areas, landfills, and waste-water treatment facilities are used during migration and the non-breeding season (Billerman et al. 2020). Social birds, herring gulls nest and feed in loose groups (Billerman et al. 2020). Peak counts of more than 19,000 of these birds have been documented in the Commonwealth during the winter (Rottenborn and Brinkley 2007).

According to BBS trend data, herring gull populations in the Eastern BBS survey region have declined 3.51% annually from 1966-2015, and 2.71% annually from 2005-2015 (Sauer et al. 2017). The number of herring gulls observed in the Commonwealth during the CBC has shown a declining trend since 1966 (National Audubon Society 2010). Watts et al. (2019) estimated the Commonwealth's breeding population at 3,914 birds in 2018. The most recent observations indicate there are a minimum of 160,746 breeding individuals in the Atlantic Flyway (Table 3.20). These estimates do not include non-breeding individuals which represent a substantial portion of the population (Kadlec and Drury 1968) and congregate in areas where they may cause damage or threats to human health and safety. For example, during the breeding season (May) an average of 14,990 non-breeding herring gulls were surveyed near a single landfill in Mooresville, Pennsylvania (J. Wood, USDA WS, unpublished data 2020). Kadlec and Drury (1968) estimated a 1 to 1 ratio of non-breeding to breeding herring gulls. Using a conservative 0.75 to 1 ratio of non-breeding to breeding herring gulls, the number of non-breeding herring gulls in Virginia and the Atlantic Flyway could be estimated at 2,936 and 120,560 individuals, respectively. Therefore, the total herring gull population could be estimated at 6,850 birds in Virginia and 281,306 birds in the Atlantic Flyway.

Table 3.20– Breeding population estimate of herring gulls nesting in the Atlantic Flyway.

State / Province	Estimate
Delaware	276[a]
Maine	42,976[b]
Maryland	3,612[c]
Massachusetts	15,008[b]
New Brunswick	9,619[a]
New Hampshire	900[a]
New Jersey	4,206[c]
New York	12,934[cdef]
Newfoundland	47,822[a]
North Carolina	750[a]
Nova Scotia	12,973[a]
Prince Edward Island	1,600[a]
Rhode Island	3,866[c]
Vermont	290[e]
Virginia	3,914[g]
TOTAL	**160,746 birds**

[a]Z. Loman, University of Maine, unpublished data (Colonial Waterbird Database USGS), 2020. Due to the extent of areas needing to be censused, entire states or provinces not always entirely

censused in the same year. Data from any given location only included once. Delaware estimate 1995, New Brunswick estimate 2010 and 2013, New Hampshire estimate 1995, Newfoundland estimate 2015, 2016 and 2017, North Carolina estimate 2017, Nova Scotia estimate 2013, Prince Edward Island estimate 2014.
[b]C. Dwyer, USFWS, personal communication, 2018. Maine, Massachusetts and New York estimates 2013.
[c]C. Dwyer, USFWS, unpublished data, 2018. Maryland, New Jersey, New York and Rhode Island estimates 2013.
[d]Surveys were conducted in different areas of the state in different years. Data from any given location only included once.
[e]Gobeille, 2019. New York and Vermont estimates 2019.
[f]C. Dwyer, USFWS, personal communication, 2020. New York estimates 2012, 2013, 2014 and 2016.
[g]Watts et al. 2019. Virginia estimate 2018.

The number of herring gulls and active herring gull nests lethally removed by WS and other entities to alleviate damage and threats in Virginia from 2011 to 2017 is shown in Table 3.21. WS dispersed an average of 98,846 herring gulls on an annual basis from 2011 to 2017.

Table 3.21 – Number of herring gulls addressed in Virginia from 2011 to 2017

	Removal Under Depredation Permits					
	Birds			Active Nests		
Year	Authorized Lethal Removal[a]	WS' Lethal Removal[bc]	Total Lethal Removal by All Entities[ad]	Authorized Lethal Removal[a]	WS' Lethal Removal[bc]	Total Lethal Removal by All Entities[ad]
2011	6,985	519	1,184	300	79	143
2012	7,100	254	1,605	400	108	55
2013	7,130	233	1,800	548	27	208
2014	7,210	224	1,498	400	25	25
2015	7,310	146	1,622	400	23	29
2016	7,360	227	1,156	400	29	26
2017	7,406	549	2,000	400	26	20
AVERAGE	**7,214**	**307**	**1,552**	**407**	**45**	**72**

[a]Data reported by calendar year, obtained from USFWS's Service Permit Issuance and Tracking System (SPITS) system, A. McCollum, USFWS, personal communication, 2018
[b]Data reported by federal fiscal year, obtained from WS' Management Information System (MIS) system
[c]WS' removal conducted under depredation permits issued to WS and other entities where WS is a subpermittee
[d]Includes WS' lethal removal as reported by USFWS's SPITS system

Direct, Indirect, and Cumulative Effects:
Based on previous requests for assistance and in anticipation of an increase in the number of requests for assistance, WS could lethally remove up to 1,250 herring gulls and remove or destroy up to 300 active herring gull nests annually under the proposed action / no action alternative to manage damage or threats of damage.

Based on the best available information, the lethal removal of up to 1,250 herring gulls annually by WS would represent 18.2% of the estimated population in the state (6,850 birds) or 0.44% of the estimated total population along the Atlantic Flyway (281,306 birds). From 2011 to 2017, an average of 1,552 herring gulls were lethally removed on an annual basis by *all* entities in the Commonwealth. If this lethal removal is reflective of future lethal removal by *other* entities, the annual cumulative lethal removal by *all* entities under the proposed action alternative could be estimated at 2,802 birds (1,552 birds by other entities, 1,250 by WS). This is equivalent to 40.91% of the estimated state population or 1.00% of the estimated population along the Atlantic Flyway. Given the magnitude of lethal removal proposed by WS

when compared to the estimated Atlantic Flyway population, WS' proposed lethal removal should not have any significant direct or cumulative impact on herring gull populations. Lethal removal of herring gulls can only occur at the discretion of the USFWS. The USFWS ensures lethal removal occurs to achieve desired objectives. WS would report the number of herring gulls lethally removed annually to the USFWS.

Additionally, impacts due to the destruction of active nests should have little adverse impact on the herring gull population. Many bird species can identify areas with regular human disturbance and low reproductive success, relocating and nesting elsewhere when confronted with repeated nest failure. Although there may be reduced fecundity for the individuals affected by nest and egg destruction, this activity has no long-term effect on breeding adult birds. This method is used by WS to inhibit nesting in an area experiencing damage due to nesting activity and is employed only at the localized level. The destruction of up to 300 active herring gull nests annually by WS would occur in localized areas where nesting takes place and would not reach a level where adverse effects on herring gull populations would occur. As with the lethal removal of birds, the removal of active nests must be authorized by the USFWS. Therefore, the number of active nests removed by WS annually would occur at the discretion of the USFWS.

Great Black-backed Gull Population Impact Analysis

Great black-backed gulls can be observed across the northeastern U.S., Canadian Maritime Provinces and Europe (Billerman et al. 2020). These birds use areas near freshwater and saltwater habitats during the breeding season and these as well as anthropogenic sites (e.g., landfills) during the non-breeding season (Billerman et al. 2020). Great black-backed gulls nest in loose colonies and loaf, roost and forage with other gull or seabird species (Billerman et al. 2020). Peak counts of more than 3,000 of these birds have been documented in the Commonwealth during the winter (Rottenborn and Brinkley 2007).

According to BBS trend data, great black-backed gull populations in the Eastern BBS survey region have declined 5.81% annually from 1966-2015, and 1.55% annually from 2005-2015 (Sauer et al. 2017). The number of great black-backed gulls observed in the Commonwealth during the CBC has shown a declining trend since 1966 (National Audubon Society 2010). Watts et al. (2019) estimated the Commonwealth's breeding population at 2,238 birds in 2018. The most recent observations indicate there are a minimum of 69,649 breeding individuals in the Atlantic Flyway (Table 3.22). These estimates do not include non-breeding individuals which represent a substantial portion of the population (Kadlec and Drury 1968) and congregate in areas where they may cause damage or threats to human health and safety. Kadlec and Drury (1968) estimated a 1 to 1 ratio of non-breeding to breeding herring gulls (although there is no published information for great black-backed gulls both species breed at about the same age (Billerman et al. 2020)). Using a conservative .75 to 1 ratio of non-breeding to breeding great black-backed gulls, the number of non-breeding great black-backed gulls in Virginia and the Atlantic Flyway could be estimated at 1,679 and 52,237 individuals, respectively. Therefore, the total great black-backed gull population could be estimated at 3,917 birds in Virginia and 121,886 birds in the Atlantic Flyway.

Table 3.22– Breeding population estimate of great black-backed gulls nesting in the Atlantic Flyway.

State / Province	Estimate
Delaware	6[a]
Maine	13,868[b]
Maryland	842[c]
Massachusetts	9,038[b]
New Brunswick	4,300[a,d]
New Hampshire	372[a]
New Jersey	2,931[c]
New York	14,000[c,d,e,f]
Newfoundland	9,867[a]
North Carolina	160[a]
Nova Scotia	8,293[a]
Prince Edward Island	1,896[a]
Rhode Island	1,838[c]
Virginia	2,238[g]
TOTAL	**69,649 birds**

[a]Z. Loman, University of Maine, unpublished data (Colonial Waterbird Database USGS), 2020. Due to the extent of areas needing to be censused, not all locations censused in the same year. Data from any given location only included once. Delaware estimate 1995, New Brunswick estimate 2010 and 2013, New Hampshire estimate 1995, Newfoundland estimate 2015, 2016, and 2017, North Carolina estimate 2017, Nova Scotia estimate 2013, and Prince Edward Island estimate 2014.
[b]C. Dwyer, USFWS, personal communication, 2018. Maine and Massachusetts estimates 2013.
[c]C. Dwyer, USFWS, unpublished data, 2018. Maryland, New Jersey, New York and Rhode Island estimates 2013.
[d]Surveys were conducted in different areas of the state/province in different years. Data from any given location only included once.
[e]Gobeille, 2019. New York estimate 2019.
[f]C. Dwyer, USFWS, personal communication, 2020. New York estimate 2014.
[g]Watts et al. 2019. Virginia estimate 2018.

The number of great black-backed gulls and active great black-backed gull nests lethally removed by WS and other entities to alleviate damage and threats in Virginia from 2011 to 2017 is shown in Table 3.23. WS dispersed an average of 1,728 great black-backed gulls on an annual basis from 2011 to 2017.

Table 3.23 – Number of great black-backed gulls addressed in Virginia from 2011 to 2017

Year	Removal Under Depredation Permits					
	Birds			Active Nests		
	Authorized Lethal Removal[a]	WS' Lethal Removal[bc]	Total Lethal Removal by All Entities[ad]	Authorized Lethal Removal[a]	WS' Lethal Removal[bc]	Total Lethal Removal by All Entities[ad]
2011	3,395	21	36	200	0	63
2012	3,415	21	41	235	0	36
2013	3,520	31	87	280	0	90
2014	3,515	23	29	235	0	30
2015	3,515	23	49	235	0	34
2016	3,525	54	32	235	0	9
2017	3,590	33	32	235	0	25
AVERAGE	**3,496**	**29**	**44**	**236**	**0**	**41**

[a]Data reported by calendar year, obtained from USFWS's Service Permit Issuance and Tracking System (SPITS) system, A. McCollum, USFWS, personal communication, 2018
[b]Data reported by federal fiscal year, obtained from WS' Management Information System (MIS) system
[c]WS' removal conducted under depredation permits issued to WS and other entities where WS is a subpermittee
[d]Includes WS' lethal removal as reported by USFWS's SPITS system

Direct, Indirect, and Cumulative Effects:
Based on previous requests for assistance and in anticipation of an increase in the number of requests for assistance, WS could lethally remove up to 300 great black-backed gulls and remove or destroy up to 100 active great black-backed gull nests annually under the proposed action / no action alternative to manage damage or threats of damage.

Based on the best available information, the lethal removal of up to 300 great black-backed gulls annually by WS would represent 7.65% of the estimated breeding population in the state (3,917 birds) or 0.24% of the estimated total population along the Atlantic Flyway (121,886 birds). From 2011 to 2017, an average of 44 great black-backed gulls were lethally removed on an annual basis by *all* entities in the Commonwealth. If this lethal removal is reflective of future lethal removal by *other* entities, the annual cumulative lethal removal by *all* entities under the proposed action alternative could be estimated at 344 birds (44 birds by other entities, 300 by WS). This is equivalent to 8.78% of the estimated state population or 0.28% of the estimated population along the Atlantic Flyway. Given the magnitude of lethal removal proposed by WS when compared to the estimated population, WS' proposed lethal removal should not have any significant direct or cumulative impact on great black-backed gull populations. Lethal removal of great black-backed gulls can only occur at the discretion of the USFWS. The USFWS ensures lethal removal occurs to achieve desired objectives. WS would report the number of great black-backed gulls lethally removed annually to the USFWS.

Additionally, impacts due to the destruction of active nests should have little adverse impact on the great black-backed gull population. Many bird species can identify areas with regular human disturbance and low reproductive success, relocating and nesting elsewhere when confronted with repeated nest failure. Although there may be reduced fecundity for the individuals affected by nest and egg destruction, this activity has no long-term effect on breeding adult birds. This method is used by WS to inhibit nesting in an area experiencing damage due to nesting activity and is employed only at the localized level. The destruction of up to 100 active great black-backed gull nests annually by WS would occur in localized areas where nesting takes place and would not reach a level where adverse effects on great black-backed gull populations would occur. As with the lethal removal of birds, the removal of active nests must be authorized by the USFWS. Therefore, the number of active nests removed by WS annually would occur at the discretion of the USFWS.

Lesser Black-backed gull Population Impact Analysis

Lesser black-backed gulls are long distance migrants, nesting primarily in Europe and migrating to spend the non-breeding season in Europe, Africa and increasingly, along the East Coast of North America (Nisbet et al. 2013). However, since the mid-1990s these birds (mostly immature birds) have also been observed frequently during the summer in the Commonwealth (Rottenborn and Brinkley 2007). They can be observed in both freshwater and saltwater habitat as well as at anthropogenic attractants such as landfills and agricultural fields (Rottenborn and Brinkley 2007, Rutt 2009). Like other gulls, lesser black-backed gulls are social, nesting, feeding, resting and migrating in flocks of up to approximately 500 birds (Davis and Dunn 1976, Verbeek 1977, Schmaljohann et al. 2008, Rutt 2009, Nisbet et al. 2013).

Because they breed primarily in Europe, no BBS data on lesser black-backed gulls is available (Sauer et al. 2017). The number of lesser black-backed gulls observed in the Commonwealth during the CBC has shown an increasing trend since 1966 (National Audubon Society 2010). There are no population estimates for lesser black-backed gulls in the Commonwealth, the region or North America. The global population was estimated at 270,000 to 320,000 pairs (540,000 to 640,000 birds) in 2004 (Nisbet et al. 2013).

Although lethal removal was authorized, no lesser black-backed gulls were lethally removed by WS or other entities to alleviate damage and threats in Virginia from 2011 to 2017. No active lesser black-backed gull nests were destroyed during this time (these birds aren't known to breed in Virginia). WS dispersed an average of one lesser black-backed gulls on an annual basis from 2011 to 2017 to alleviate damage and threats.

Direct, Indirect, and Cumulative Effects:
Based on previous requests for assistance and in anticipation of an increase in the number of requests for assistance, WS could lethally remove up to 200 lesser black-backed gulls annually under the proposed action / no action alternative to manage damage or threats of damage.

Based on the best available information, the lethal removal of up to 200 lesser black-backed gulls annually by WS would represent 0.03 to 0.04% of the global population (540,000 to 640,000 birds). From 2011 to 2017, no lesser black-backed gulls were lethally removed in the Commonwealth. If this lethal removal is reflective of future lethal removal by *other* entities, the annual cumulative lethal removal by *all* entities under the proposed action alternative could be estimated at 200 birds. Given the limited magnitude of lethal removal proposed by WS when compared to the estimated population, WS' proposed lethal removal should not have any significant direct or cumulative impact on lesser black-backed gull populations. Lethal removal of lesser black-backed gulls can only occur at the discretion of the USFWS. The USFWS ensures lethal removal occurs to achieve desired objectives. WS would report the number of lesser black-backed gulls lethally removed annually to the USFWS.

Least Tern Population Impact Analysis

Least terns can be observed along rivers and the Atlantic and Gulf coasts during the breeding season (Billerman et al. 2020). Preferred habitat includes sparsely vegetated sand bars or mudflats, gravel or sand pits and gravel rooftops (Billerman et al. 2020). Birds nest once per year in colonies and roost, feed and migrate in flocks (Billerman et al. 2020). In Virginia, nesting colonies during the 2018 survey ranged in size from 1 to 258 pairs (Watts et al. 2019).

According to BBS trend data, least tern populations in the Eastern BBS survey region have declined 4.80% annually from 1966-2015, and 3.83% annually from 2005-2015 (Sauer et al. 2017). No trend data

from the BBS in Virginia is available (Sauer et al. 2017). In contrast, Nisbet et al. (2013) states that the number of least terns has increased from North Carolina northward since 1977. These birds are not present in the Commonwealth during the time of year the CBC is conducted and therefore no trend data is available (National Audubon Society 2010). There were an estimated 991 breeding pairs (1,982 birds) nesting in the Commonwealth during the 2019 breeding season (Watts et al. 2019). The population of breeding least terns in BCR 30 is estimated at 16,018 birds (MANEM 2006) while the breeding population in BCR 27 is estimated at 20,300 birds (Hunter et al. 2006). Nisbet et al. (2013) estimated that there were 34,000 least terns breeding from the Bay of Fundy south to the Straits of Florida although this figure is likely too low. The North American population has been estimated at 60,000 to 100,000 breeding birds (Kushlan et al. 2002) and 60,000 breeding birds (Nisbet et al. 2013). However, the estimate of 60,000 is uncertain because of least tern's scattered breeding distribution and frequent moves between nesting locations (Nisbet et al. 2013). These estimates do not reflect non-breeding birds that may be present in these areas during the breeding season. These birds are included on USFWS's regional list of bird species of concern (Appendix D).

Although lethal removal was authorized, no least terns were lethally removed by WS or other entities to alleviate damage and threats in Virginia from 2011 to 2017. No active least tern nests were destroyed during this time. WS dispersed an average of five least terns on an annual basis from 2011 to 2017 to alleviate damage and threats.

Direct, Indirect, and Cumulative Effects:
Based on previous requests for assistance and in anticipation of an increase in the number of requests for assistance, WS could lethally remove up to 10 least terns and remove or destroy up to 10 active least tern nests annually under the proposed action / no action alternative to manage damage or threats of damage.

Based on the best available information, the lethal removal of up to 10 least tern annually by WS would represent 0.5% of the population of breeding birds in Virginia (1,982 birds), 0.03% of the breeding population in BCR 30 and 27 or along the East Coast (36,318 birds or 34,000 birds) and 0.01 to 0.02% of the population in North America (60,000 to 100,000 birds). From 2011 to 2017, no least terns were lethally removed in the Commonwealth. If this lethal removal is reflective of future lethal removal by *other* entities, the annual cumulative lethal removal by *all* entities under the proposed action alternative could be estimated at 10 birds. Given the limited magnitude of lethal removal proposed by WS when compared to the estimated population, WS' proposed lethal removal should not have any significant direct or cumulative impact on least tern populations. Lethal removal of least terns can only occur at the discretion of the USFWS. The USFWS ensures lethal removal occurs to achieve desired objectives. WS would report the number of least terns lethally removed annually to the USFWS.

Additionally, impacts due to the destruction of active nests should have little adverse impact on the least tern population. Many bird species can identify areas with regular human disturbance and low reproductive success, relocating and nesting elsewhere when confronted with repeated nest failure. Although there may be reduced fecundity for the individuals affected by nest and egg destruction, this activity has no long-term effect on breeding adult birds. This method is used by WS to inhibit nesting in an area experiencing damage due to nesting activity and is employed only at the localized level. The destruction of up to 10 active least tern nests annually by WS would occur in localized areas where nesting takes place and would not reach a level where adverse effects on least tern populations would occur. As with the lethal removal of birds, the removal of active nests must be authorized by the USFWS. Therefore, the number of active nests removed by WS annually would occur at the discretion of the USFWS.

Gull-billed Tern Population Impact Analysis

Gull-billed terns breed in scattered locations across the Atlantic coast, Florida and the Caribbean wintering in more southern localities (Billerman et al. 2020). Birds nest once per year in colonies (< 50 pairs) on sandy beaches, mudflats, dredged spoil or impoundments and sometimes gravel rooftops (Billerman et al. 2020). In Virginia, nesting colonies range in size from 5 to 158 pairs (Watts et al. 2019).

According to BBS trend data, gull-billed tern populations in the Eastern BBS survey region have declined 4.78% annually from 1966-2015 and increased 2.47% annually from 2005-2015 (Sauer et al. 2017). No trend data from the BBS in Virginia is available (Sauer et al. 2017). Gull-billed terns are not present in the Commonwealth during the time of year the CBC is conducted and therefore no trend data is available (National Audubon Society 2010). There were an estimated 349 breeding pairs (698 birds) nesting in the Commonwealth during the 2019 breeding season (Watts et al. 2019). The population of breeding gull-billed terns in BCR 30 is estimated at 2,418 birds and the population of breeding gull-bill terns in BCR 27 is estimated at 1,050 birds (Hunter et al. 2006). Nisbet et al. (2013) estimated that there were 1,560 gull-billed terns breeding from the Bay of Fundy south to the Straits of Florida. The North American population has been estimated at 6,000 to 8,000 breeding birds (Kushlan et al. 2002) and 8,600 to 11,400 breeding birds (Nisbet et al. 2013). These estimates do not reflect non-breeding birds that may be present in these areas during the breeding season. Although not listed by the federal government under the Endangered Species Act, this species is listed as threatened by the Commonwealth of Virginia. These birds are also included on USFWS's regional list of bird species of concern (Appendix D).

From 2011 to 2017, WS did not utilize harassment to disperse gull-billed terns to alleviate damage and threats in Virginia.

Direct, Indirect, and Cumulative Effects:
WS has previously received requests for assistance associated with gull-billed terns from airports. Under the proposed action / no action alternative, WS could employ harassment methods to manage damage or threats of damage associated with these birds. No destruction of eggs or lethal removal of birds is proposed.

Impacts due to harassment would be beneficial, insignificant or discountable to the gull-billed tern population. These methods are used by WS to inhibit use of an area (e.g., an airport) where damage is occurring (e.g., gull-billed tern-aircraft collisions) and are employed only at the localized level. Harassment of birds from the damage area airport may be beneficial to the birds by reducing or preventing mortality resulting from collisions with aircraft. WS's use of these methods would not reach a level where any significant direct or cumulative impact on gull-billed terns would occur.

Caspian Tern Population Impact Analysis

The largest tern, Caspian terns can be observed during the breeding season in scattered locations in the Western U.S. and Canada and the Great Lakes, as well as along the Atlantic, Gulf and Pacific coasts in sparsely vegetated sandy, muddy or gravel shorelines (Billerman et al. 2020). Caspian terns migrate to more southern regions during the non-breeding season (Billerman et al. 2020). Birds wintering along the U.S. East Coast are primarily from the Great Lakes population (Shuford and Craig 2002, Nisbet et al. 2013). Caspian terns nests once a year in colonies and migrate in flocks (rarely in the thousands) (Billerman et al. 2020). In Virginia, peak counts of as many as 400 of these birds have been documented in recent years (2004) during migration (Rottenborn and Brinkley 2007).

According to BBS trend data, Caspian tern populations in the Eastern BBS survey region have declined 1.09% annually from 1966–2015 and increased 3.33% annually from 2005-2015 (Sauer et al. 2017). No trend data from the BBS in Virginia is available (Sauer et al. 2017). However, the number of breeding birds in Virginia has remained relatively stable over the last 100 years (0 to 7 pairs observed) (Weske et al. 1977, Watts et al. 2019). Caspian terns are not present in the Commonwealth during the time of year the CBC is conducted and therefore no trend data is available (National Audubon Society 2010). There was only a single breeding pair (2 birds) nesting in the Commonwealth during the 2019 breeding season (Watts et al. 2019). Nisbet et al. (2013) estimated that there were 88 Caspian terns breeding from the Bay of Fundy south to the Straits of Florida. The population of breeding Caspian terns in BCR 30 is estimated at 24 birds (MANEM 2006) while the breeding population in BCR 27 is estimated at 544 birds (Hunter et al. 2006). Additionally, the population of breeding Caspian terns in BCR 12 and 13 (the Great Lakes), where the majority of birds wintering in the Commonwealth are from, are estimated at 6,800 and 6,000 birds respectively (Wires et al. 2010) or alternatively >16,000 birds for the entire Great Lakes region (Nisbet et al. 2013). Wires and Cuthbert (2000) estimated the North America breeding population at 64,000 to 68,000 birds (with 20% of the birds comprising the Atlantic and Great Lakes Populations), while Kushlan et al. (2002) estimated the same population at 66,000 to 70,000 birds. The North American population estimates should be interpreted cautiously, and both should be considered minimum estimates (Shuford and Craig 2002). These estimates do not reflect non-breeding birds.

The number of Caspian terns lethally removed by WS or other entities to alleviate damage and threats in Virginia from 2011 to 2017 is shown in Table 3.24. No active Caspian tern nests were destroyed during this time. WS dispersed an average of 133 Caspian terns on an annual basis from 2011 to 2017 to alleviate damage and threats.

Table 3.24 – Number of Caspian terns addressed in Virginia from 2011 to 2017

	Removal Under Depredation Permits		
Year	**Authorized Lethal Removal[a]**	**WS' Lethal Removal[bc]**	**Total Lethal Removal by All Entities[ad]**
2011	55	7	7
2012	55	2	0
2013	55	0	3
2014	55	16	9
2015	65	9	0
2016	65	0	0
2017	70	0	0
AVERAGE	**60**	**5**	**3**

[a]Data reported by calendar year, obtained from USFWS's Service Permit Issuance and Tracking System (SPITS) system, A. McCollum, USFWS, personal communication, 2018
[b]Data reported by federal fiscal year, obtained from WS' Management Information System (MIS) system
[c]WS' removal conducted under depredation permits issued to WS and other entities where WS is a subpermittee
[d]Includes WS' lethal removal as reported by USFWS's SPITS system

Direct, Indirect, and Cumulative Effects:
Based on previous requests for assistance and in anticipation of an increase in the number of requests for assistance, WS could lethally remove up to 40 Caspian terns annually under the proposed action / no action alternative to manage damage or threats of damage.

Based on the best available information, the lethal removal of up to 40 Caspian terns annually by WS would represent 0.3% of the breeding population in BCR 12, 13, 27 and 30 (13,368), and 0.3% of the breeding Atlantic and Great Lakes Populations (12,800 to 13,600) or 0.06% of the breeding population in

North America (64,000 to 70,000 birds). Although these birds have been identified breeding in Virginia, most of the birds that can be observed in the Commonwealth breed in the Great Lakes. From 2011 to 2017, 3 Caspian terns were lethally removed by other entities in the Commonwealth. If this lethal removal is reflective of future lethal removal by *other* entities, the annual cumulative lethal removal by *all* entities under the proposed action alternative could be estimated at 43 birds (3 birds by other entities, 40 birds by WS). This is equivalent to 0.3% of the breeding population in BCR 12, 13, 27 and 30 (13,368), and 0.3% of the breeding Atlantic and Great Lakes Populations (12,800 to 13,600) or 0.07% of the breeding population in North America (64,000 to 70,000 birds). The number of Caspian terns present in Virginia fluctuates throughout the year. Those birds nesting in BCR 12 and 13 (the Great Lakes) are the same birds present in Virginia during the non-breeding season. These estimates don't include non-breeding birds. Given the limited magnitude of lethal removal proposed by WS when compared to the estimated population which may be present in the Commonwealth during the non-breeding season, WS' proposed lethal removal should not have any significant direct or cumulative impact on Caspian tern populations. Lethal removal of Caspian terns can only occur at the discretion of the USFWS. The USFWS ensures lethal removal occurs to achieve desired objectives. WS would report the number of Caspian terns lethally removed annually to the USFWS.

Black Skimmer Population Impact Analysis

Black skimmers can be observed from New England south along the Atlantic coast, all along the Gulf Coast and from California south along the Pacific Coast in coastal habitat (Billerman et al. 2020). Birds nest once a year with other black skimmers alongside terns on sparsely vegetated beaches, dredge deposits or on dead vegetation mats in salt marsh (Billerman et al. 2020). Outside the breeding season black skimmers form flocks of up to several hundred individuals (Billerman et al. 2020). In Virginia, nesting colonies range in size from 2 to 602 pairs (Watts et al. 2019).

According to BBS trend data, black skimmer populations in the Eastern BBS survey region have declined 4.93% annually from 1966-2015, and 1.51% annually from 2005-2015 (Sauer et al. 2017). No trend data from the BBS in Virginia is available (Sauer et al. 2017). The number of black skimmers present in the commonwealth during the CBC has declined since 1966 (National Audubon Society 2010). There were an estimated 1,567 breeding pairs (3,134 birds) nesting in the Commonwealth during the 2019 breeding season (Watts et al. 2019). The population of breeding black skimmers in BCR 30 is estimated at 10,058 birds (MANEM 2006) while the breeding population in BCR 27 is estimated at 5,738 birds (Hunter et al. 2006). Nisbet et al. (2013) estimated that there were 13,800 black skimmers breeding from the Bay of Fundy south to the Straits of Florida. The North American population is estimated at 65,000 to 70,000 breeding birds (Kushlan et al. 2002). These estimates do not reflect non-breeding birds that may be present in these areas during the breeding season. These birds are included on USFWS's regional list of bird species of concern (Appendix D).

Although lethal removal was authorized, no black skimmers or black skimmer nests were lethally removed by WS or other entities to alleviate damage and threats in Virginia from 2011 to 2017. WS dispersed an average of 87 black skimmers on an annual basis from 2011 to 2017 to alleviate damage and threats.

Direct, Indirect, and Cumulative Effects:
Based on previous requests for assistance and in anticipation of an increase in the number of requests for assistance, WS could lethally remove up to 10 black skimmers and remove or destroy up to 10 active black skimmer nests annually under the proposed action / no action alternative to manage damage or threats of damage.

Based on the best available information, the lethal removal of up to 10 black skimmer annually by WS would represent 0.3% of the population of breeding birds in Virginia (3,134 birds), 0.06% of the breeding population in BCR 30 and 27 (15,796 birds), 0.07% of the breeding population along the east coast (13,800 birds) and 0.02% to 0.01% of the population in North America (65,000 to 70,000). From 2011 to 2017, no black skimmers were lethally removed in the Commonwealth. If this lethal removal is reflective of future lethal removal by *other* entities, the annual cumulative lethal removal by *all* entities could be estimated at 10 birds. Given the limited magnitude of lethal removal proposed by WS when compared to the estimated population, WS' proposed lethal removal should not have any significant direct or cumulative impact on black skimmer populations. Lethal removal of black skimmers can only occur at the discretion of the USFWS. The USFWS ensures lethal removal occurs to achieve desired objectives. WS would report the number of black skimmers lethally removed annually to the USFWS.

Additionally, impacts due to the destruction of active nests should have little adverse impact on the black skimmer population. Many bird species can identify areas with regular human disturbance and low reproductive success, relocating and nesting elsewhere when confronted with repeated nest failure. Although there may be reduced fecundity for the individuals affected by nest and egg destruction, this activity has no long-term effect on breeding adult birds. This method is used by WS to inhibit nesting in an area experiencing damage due to nesting activity and is employed only at the localized level. The destruction of up to 10 active black skimmer nests annually by WS would occur in localized areas where nesting takes place and would not reach a level where adverse effects on black skimmer populations would occur. As with the lethal removal of birds, the removal of active nests must be authorized by the USFWS. Therefore, the number of active nests removed by WS annually would occur at the discretion of the USFWS.

Common Loon Population Impact Analysis

Common loons can be observed across most of the U.S. and Canada including Virginia (Billerman et al. 2020). In Virginia, common loons can be observed during the nonbreeding season on large lakes, reservoirs and rivers and in coastal waters (i.e., bays, channels) (Billerman et al. 2020). During the non-breeding season birds will form flocks (>1,000) for staging, foraging, and roosting (Billerman et al. 2020). Peak counts of these birds in the Commonwealth have exceeded 2,300 individuals (Mathews County, 1994) (Rottenborn and Brinkley 2007).

According to BBS trend data, common loon populations in the Eastern BBS survey region have increased 0.68% annually from 1966-2015, and 0.94% annually from 2005-2015 (Sauer et al. 2017). Because they are not present in Virginia during the breeding season, no trend data from the BBS for common loons in Virginia is available (Sauer et al. 2017). The number of common loons observed in the Commonwealth during the CBC has shown an increasing trend since 1966 (National Audubon Society 2010). There are no population estimates for common loons in Virginia. The population of breeding common loons in BCR 14 is estimated at 9,970 birds (MANEM 2006) while the population of breeding common loons in BCR 12 and 13 (the Great Lakes) are estimated at 109,106 to 110,998 and 610 birds respectively (Wires et al. 2010). Data indicates that birds nesting in BCR 12, 13 and 14 migrate southeast to wintering areas along the Atlantic (Evers et al. 2010) and would therefore be the same birds that could be observed in Virginia. Nisbet et al. (2013) estimates that during the non-breeding season common loons from the Bay of Fundy south to the Straits of Florida number in the high 10,000s. MANEM (2006) cites an estimate of 575,000 birds in the North America population, while Wires et al. (2010) cites an estimate of 504,000 to 528,000 birds in North America and Nisbet (2013) states that the North American population is 300,000 birds. These estimates do not reflect non-breeding birds.

Although lethal removal was authorized, no common loons were lethally removed by WS or other entities to alleviate damage and threats in Virginia from 2011 to 2017. No active common loon nests were destroyed during this time (these birds do not breed in the Commonwealth). WS did not disperse any common loons on an annual basis from 2011 to 2017 to alleviate damage and threats.

Direct, Indirect, and Cumulative Effects:
Based on previous requests for assistance and in anticipation of an increase in the number of requests for assistance, WS could lethally remove up to 20 common loons annually under the proposed action / no action alternative to manage damage or threats of damage.

Based on the best available information, the lethal removal of up to 20 common loon annually by WS would represent 0.008% of the population of breeding birds in BCR 12, 13 and 14 (230,074), 0.02% of an estimate of the birds breeding along the east coast (high 10,000s) and 0.003% of the estimated North American population (504,000 to 575,000 birds). From 2011 to 2017, no common loons were lethally removed in the Commonwealth. If this lethal removal is reflective of future lethal removal by *other* entities, the annual cumulative lethal removal by *all* entities under the proposed action alternative could be estimated at 20 birds. Given the limited magnitude of lethal removal proposed by WS when compared to the estimated population, WS' proposed lethal removal should not have any significant direct or cumulative impact on common loon populations. Lethal removal of common loons can only occur at the discretion of the USFWS. The USFWS ensures lethal removal occurs to achieve desired objectives. WS would report the number of common loons lethally removed annually to the USFWS.

Anhinga Population Impact Analysis

Distinctive birds, anhingas can be observed in shallow, slow-moving waters across the Southeastern U.S. and Virginia during the breeding season (Billerman et al. 2020, Watts 2018). Anhingas nest once a year, colonially with other anhingas and often near colonies of other waterbirds (Billerman et al. 2020). These birds may occur in mixed-species flocks of up to several hundred birds (Billerman et al. 2020).

According to BBS trend data, anhinga populations in Virginia have increased 0.52% annually from 1966-2015, and 1.94% annually from 2005-2015 (Sauer et al. 2017). The number of anhingas observed in the Commonwealth during the CBC has shown an increasing trend since 1966 (National Audubon Society 2010). A cursory three-day survey in 2018 found 15 active nests located at 6 sites across five jurisdictions in Virginia (Watts 2018). There has been a northward expansion of anhingas in recent decades and sightings of anhingas have increased dramatically in the Commonwealth since 2010 (Watts 2018). The population of breeding anhingas in BCR 27 and 28 is estimated at 9,200 and 40 birds respectively (Hunter et al. 2006). Kushlan et al. (2002) estimated the U.S. breeding population at 20,000 to 34,000 birds while Wetlands International (2012) estimates the total population in the Southeastern U.S., Mexico and Central America is 25 to 100,000 birds.

Although lethal removal was authorized, no anhingas or active anhinga nests were lethally removed by WS or other entities to alleviate damage and threats in Virginia from 2011 to 2017. WS did not disperse any anhingas during this period.

Direct, Indirect, and Cumulative Effects:
In anticipation of requests for assistance, WS could lethally remove up to 20 anhingas and remove or destroy up to 20 active anhinga nests annually under the proposed action / no action alternative to manage damage or threats of damage.

Based on the best available information, the lethal removal of up to 20 anhingas annually by WS would represent 0.21% of the breeding population of anhingas in BCR 27 and 28 and 0.1% to 0.05% of the U.S.

breeding population (20,000 to 34,000 birds). From 2011 to 2017, no anhingas were lethally removed in the Commonwealth. If this lethal removal is reflective of future lethal removal by *other* entities, the annual cumulative lethal removal by *all* entities under the proposed action alternative could be estimated at 20 birds. Given the limited magnitude of lethal removal proposed by WS when compared to the estimated population, WS' proposed lethal removal should not have any significant direct or cumulative impact on anhinga populations. Lethal removal of anhingas can only occur at the discretion of the USFWS. The USFWS ensures lethal removal occurs to achieve desired objectives. WS would report the number of anhingas lethally removed annually to the USFWS.

Additionally, impacts due to the destruction of active nests should have little adverse impact on the anhinga population. Many bird species can identify areas with regular human disturbance and low reproductive success, relocating and nesting elsewhere when confronted with repeated nest failure. Although there may be reduced fecundity for the individuals affected by nest and egg destruction, this activity has no long-term effect on breeding adult birds. This method is used by WS to inhibit nesting in an area experiencing damage due to nesting activity and is employed only at the localized level. The destruction of up to 20 active anhinga nests annually by WS would occur in localized areas where nesting takes place and would not reach a level where adverse effects on anhinga populations would occur. As with the lethal removal of birds, the removal of active nests must be authorized by the USFWS. Therefore, the number of active nests removed by WS annually would occur at the discretion of the USFWS.

Double-crested Cormorant Population Impact Analysis

With a widely distributed and expanding range, double-crested cormorants can be observed in most of North America's coastal areas, major rivers and drainages (Billerman et al. 2020). Birds can be observed year-round in Virginia. Highly social birds, double-crested cormorants nest colonially (once on an annual basis) and roost, loaf, feed and travel in large flocks (tens to thousands of birds depending upon activity) (Billerman et al. 2020). During migration, very large numbers occur in Virginia from areas to the North; in the spring, estimates at Fisherman Island Refuge on the Eastern Shore of the Chesapeake Bay range from 20,000 – 30,000 to as many as 300,000 birds (Wires et al. 2001, Guillaumet et al. 2011).

According to BBS trend data, double-crested cormorant populations in Virginia have increased 12.5% annually from 1966-2015, and 20.35% annually from 2005-2015 (Sauer et al. 2017). The number of double-crested cormorants observed in the Commonwealth during the CBC has shown an increasing trend since 1966 (National Audubon Society 2010). There were an estimated 5,012 breeding pairs (10,024 birds) nesting in the Commonwealth during the 2018 breeding season, an increase of 1,315% from 25 years ago (Watts et al. 2019). Outside of the breeding season, birds from more northern states and Canadian provinces can be observed in Virginia. The most recent observations of breeding double-crested cormorants in these more northern regions indicates that these birds number between 96,619 and 106,851 breeding pairs or 193,238 to 213,702 breeding individuals (Table 3.25). These estimates do not include non-breeding individuals which authors have estimated may represent 19.5% to substantially more of the population (Dorr et al. 2016, Wires et al. 2001).

Table 3.25– Number of breeding pairs of double-crested cormorants in states or Canadian provinces that are likely to migrate through and be present in Virginia during the nonbreeding season

State / Province	Estimate
Connecticut	858[a]
Delaware	36[b]
Maine	10,141[a]
Maryland	2,900[c]
Massachusetts	6,883[a]
New Brunswick	10,808[a]
New Hampshire	20[d]
New Jersey	<100[d]
New York	6,333[e]
Newfoundland	768-9,000[f]
Nova Scotia	12,000–14,000[b]
Pennsylvania	65[g]
Prince Edward Island	7,695[d]
Quebec	28,600[bh]
Rhode Island	2,400[a]
Vermont	2,000[a]
Virginia	5,012[i]
TOTAL	**96,619 to 106,851 breeding pairs**

[a]C. Dwyer, USFWS, personal communication, 2018. Connecticut, Maine, Massachusetts, estimates 2013, New Brunswick estimate 2010, Rhode Island estimate 2014, Vermont estimate 2016.
[b]Atlantic and Mississippi Flyway Council 2010. Delaware estimate 2009, Nova Scotia estimate 2010. Quebec estimate 1986–2004.
[c]J. Stanton, USFWS, personal communication, 2017. Maryland estimate 2013.
[d]Wires et al. 2001. New Hampshire estimate 1998, New Jersey estimate 2010, Prince Edward Island estimate 1999.
[e]New York State Department of Environmental Conservation, 2016. New York estimate 2016.
[f]Thomas et al. 2014, province was not all censused in a single year. Newfoundland estimate 2005–2007).
[g]Barber and Gross 2017. Pennsylvania estimate 2017.
[h]Province is not actively tracking populations, different colonies censused in different years
[i]Watts et al. 2019. Virginia estimate 2018.

The number of double-crested cormorants and active double-crested cormorant nests lethally removed by WS or other entities to alleviate damage and threats in Virginia from 2011 to 2017 is shown in Table 3.26. WS dispersed an average of 9,280 double-crested cormorants on an annual basis from 2011 to 2017 to alleviate damage and threats.

Table 3.26 – Number of double-crested cormorants addressed in Virginia from 2011 to 2017

Year	Removal Under Depredation Permits					
	Birds			Active Nests		
	Authorized Lethal Removal[a]	WS' Lethal Removal[bc]	Total Lethal Removal by All Entities[ad]	Authorized Lethal Removal[a]	WS' Lethal Removal[bc]	Total Lethal Removal by All Entities[ad]
2011	695	139	198	1,000	0	54
2012	795	186	151	1,000	5	50
2013	846	514	282	1,000	0	25
2014	1,255	253	97	1,000	0	30
2015	1,355	72	331	1,000	0	45
2016	1,205	199	65	500	0	54
2017	335	57	23	0	0	0
AVERAGE	**927**	**203**	**164**	**786**	**<1**	**37**

[a]Data reported by calendar year, obtained from USFWS's Service Permit Issuance and Tracking System (SPITS) system, A. McCollum, USFWS, personal communication, 2018
[b]Data reported by federal fiscal year, obtained from WS' Management Information System (MIS) system
[c]WS' removal conducted under depredation permits issued to WS and other entities where WS is a subpermittee
[d]Includes WS' lethal removal as reported by USFWS's SPITS system

Direct, Indirect, and Cumulative Effects:
Based on previous requests for assistance and in anticipation of an increase in the number of requests for assistance, WS could lethally remove up to 1,000 double-crested cormorants and remove or destroy up to 500 active double-crested cormorants nests annually under the proposed action / no action alternative to manage damage or threats of damage.

Based on the best available information, the lethal removal of up to 1,000 double-crested cormorants annually by WS would represent 9.9% of the population of breeding birds in Virginia (10,024 birds) and 0.5% of the population of birds from more northern states and Canadian provinces which can be observed in Virginia during the non-breeding season (193,238 to 213,702 birds). From 2011 to 2017, an average of 164 double-crested cormorants were lethally removed on an annual basis by *all* entities in the Commonwealth. If this lethal removal is reflective of future lethal removal by *other* entities, the annual cumulative lethal removal by *all* entities under the proposed action alternative could be estimated at 1,164 birds (164 birds by other entities, 1,000 by WS). This is equivalent to 11.6% of the population of breeding birds in Virginia, and 0.5% to 0.6% of the population of birds from more northern states and Canadian provinces which can be observed in Virginia during the non-breeding season. These estimates don't include non-breeding birds. Given the limited magnitude of lethal removal proposed by WS when compared to the estimated population which may be present in the Commonwealth during the non-breeding season, WS' proposed lethal removal should not have any significant direct or cumulative impact on double-crested cormorant populations. Lethal removal of double-crested cormorants can only occur at the discretion of the USFWS. The USFWS ensures lethal removal occurs to achieve desired objectives. WS would report the number of double-crested cormorants lethally removed annually to the USFWS.

Additionally, impacts due to the destruction of active nests should have little adverse impact on the double-crested cormorant population. Many bird species can identify areas with regular human disturbance and low reproductive success, relocating and nesting elsewhere when confronted with repeated nest failure. Although there may be reduced fecundity for the individuals affected by nest and

egg destruction, this activity has no long-term effect on breeding adult birds. This method is used by WS to inhibit nesting in an area experiencing damage due to nesting activity and is employed only at the localized level. The destruction of up to 500 active double-crested cormorant nests annually by WS would occur in localized areas where nesting takes place and would not reach a level where adverse effects on double-crested cormorant populations would occur. As with the lethal removal of birds, the removal of active nests must be authorized by the USFWS. Therefore, the number of active nests removed by WS annually would occur at the discretion of the USFWS.

American Bittern Population Impact Analysis

American bitterns can be observed across northern portions of the U.S. and Southern Canada including Virginia during the breeding season in freshwater wetlands (Billerman et al. 2020). During the non-breeding season, American bittern can be observed in coastal states from California south into Mexico and from New Jersey south along the Gulf coast to Mexico in freshwater wetlands, brackish coastal marshes and dry grasslands (Billerman et al. 2020). Generally solitary birds, American bitterns will form groups during migration (Billerman et al. 2020).

According to BBS trend data, American bittern populations in the Eastern U.S. BBS survey region declined 0.46% annually from 1966-2015 but increased 0.27% annually from 2005-2015 (Sauer et al. 2017). The number of American bitterns observed in the Commonwealth during the CBC has shown a declining trend since 1966 (National Audubon Society 2010). There are no statewide or regional population estimates available for these birds. The North American population is estimated at 3 million birds (MANEM 2006) and 2,980,000 birds (Wetlands International 2012). These estimates do not reflect non-breeding birds. These birds are included on USFWS's regional list of bird species of concern (Appendix D).

Although lethal removal was authorized, no American bitterns or active American bittern nests were lethally removed by WS or other entities to alleviate damage and threats in Virginia from 2011 to 2017. WS did not disperse any American bitterns from 2011 to 2017 to alleviate damage and threats.

Direct, Indirect, and Cumulative Effects:
In anticipation of requests for assistance, WS could lethally remove up to 20 American bitterns and remove or destroy up to 20 active American bittern nests annually under the proposed action / no action alternative to manage damage or threats of damage.

Based on the best available information, the lethal removal of up to 20 American bitterns annually by WS would represent 0.0007% of the North American population (3 million or alternatively 2,980,000 birds). From 2011 to 2017, no American bitterns were lethally removed in the Commonwealth. If this lethal removal is reflective of future lethal removal by *other* entities, the annual cumulative lethal removal by *all* entities under the proposed action alternative could be estimated at 20 birds. Given the limited magnitude of lethal removal proposed by WS when compared to the estimated population, WS' proposed lethal removal should not have any significant direct or cumulative impact on American bittern populations. Lethal removal of American bitterns can only occur at the discretion of the USFWS. The USFWS ensures lethal removal occurs to achieve desired objectives. WS would report the number of American bitterns lethally removed annually to the USFWS.

Additionally, impacts due to the destruction of active nests should have little adverse impact on the American bittern population. Many bird species can identify areas with regular human disturbance and low reproductive success, relocating and nesting elsewhere when confronted with repeated nest failure. Although there may be reduced fecundity for the individuals affected by nest and egg destruction, this activity has no long-term effect on breeding adult birds. This method is used by WS to inhibit nesting in

an area experiencing damage due to nesting activity and is employed only at the localized level. The destruction of up to 20 active American bittern nests annually by WS would occur in localized areas where nesting takes place and would not reach a level where adverse effects on American bittern populations would occur. As with the lethal removal of birds, the removal of active nests must be authorized by the USFWS. Therefore, the number of active nests removed by WS annually would occur at the discretion of the USFWS.

Great Egret Population Impact Analysis

Great egrets can be observed across the U.S., along the Atlantic, Pacific, and Gulf coasts and in major river drainages in a variety of freshwater and saltwater wetland habitats, as well as flooded agricultural fields (Billerman et al. 2020). A colonial nester, great egrets nest once a year alongside other wading birds (two to several thousand nests) (Billerman et al. 2020). Birds will also migrate in small flocks (<25 individuals) and feed in groups (10 to 20 individuals) alongside other wading birds (Billerman et al. 2020). Peak counts of these birds in the Commonwealth (during the non-breeding season or away from nesting colonies) number in the hundreds (Rottenborn and Brinkley 2007); while colonies can contain >350 nesting individuals (Watts and Paxton 2014).

According to BBS trend data, great egret populations in Virginia have increased 7.43% annually from 1966-2015, and 8.13% annually from 2005-2015 (Sauer et al. 2017). The number of great egrets observed in the Commonwealth during the CBC has shown a declining trend since 1966 (National Audubon Society 2010). In 2013 during the last complete survey for these birds, there were an estimated 2,894 breeding pairs (5,788 birds) nesting in the Commonwealth (Watts and Paxton 2014, Watts et al. 2019). In 2018, an incomplete survey counted 1,527 breeding pairs (3,054 birds) (Watts et al. 2019). The population of breeding great egrets in BCR 14 and 30 is estimated at 4 and 9,142 breeding birds respectively (MANEM 2006) while the breeding population in BCR 27, 28 and 29 is estimated at 56,488, 1,700 and 800 birds respectively (Hunter et al. 2006). The North American population is estimated at >180,000 breeding birds (Kushlan et al. 2002). These estimates do not reflect non-breeding birds.

The number of great egrets lethally removed by WS or other entities to alleviate damage and threats in Virginia from 2011 to 2017 is shown in Table 3.27. No active great egret nests were destroyed during this time. WS dispersed an average of 188 great egrets on an annual basis from 2011 to 2017 to alleviate damage and threats.

Table 3.27 – Number of great egrets addressed in Virginia from 2011 to 2017

	Removal Under Depredation Permits		
Year	Authorized Lethal Removal[a]	WS' Lethal Removal[bc]	Total Lethal Removal by All Entities[ad]
2011	69	14	23
2012	86	29	48
2013	123	31	51
2014	128	17	41
2015	215	7	45
2016	225	35	101
2017	173	19	12
AVERAGE	**146**	**22**	**46**

[a]Data reported by calendar year, obtained from USFWS's Service Permit Issuance and Tracking System (SPITS) system, A. McCollum, USFWS, personal communication, 2018
[b]Data reported by federal fiscal year, obtained from WS' Management Information System (MIS) system
[c]WS' removal conducted under depredation permits issued to WS and other entities where WS is a subpermittee

[d]Includes WS' lethal removal as reported by USFWS's SPITS system

Direct, Indirect, and Cumulative Effects:
Based on previous requests for assistance and in anticipation of an increase in the number of requests for assistance, WS could lethally remove up to 100 great egrets and remove or destroy up to 50 active great egret nests annually under the proposed action / no action alternative to manage damage or threats of damage.

Based on the best available information, the lethal removal of up to 100 great egrets annually by WS would represent 1.7% of Virginia's breeding population (5,788 birds), 0.1% of BCR 14, 27, 28, 29 and 30's breeding population (68,134 birds), or alternatively, <0.06% of the North American breeding population (>180,000 birds). From 2011 to 2017, an average of 46 great egrets were lethally removed by *all* entities in the Commonwealth. If this lethal removal is reflective of future lethal removal by *other* entities, the annual cumulative lethal removal by *all* entities under the proposed action alternative could be estimated at 146 birds (46 birds by other entities, 100 birds by WS). This is equivalent to 2.5% of Virginia's breeding population, 0.2% of BCR 14, 27, 28, 29 and 30's breeding population, or alternatively, 0.08% of the North American breeding population. These estimates don't include non-breeding birds. Given the limited magnitude of lethal removal proposed by WS when compared to the estimated population, WS' proposed lethal removal should not have any significant direct or cumulative impact on great egret populations. Lethal removal of great egrets can only occur at the discretion of the USFWS. The USFWS ensures lethal removal occurs to achieve desired objectives. WS would report the number of great egrets lethally removed annually to the USFWS.

Additionally, impacts due to the destruction of active nests should have little adverse impact on the great egret population. Many bird species can identify areas with regular human disturbance and low reproductive success, relocating and nesting elsewhere when confronted with repeated nest failure. Although there may be reduced fecundity for the individuals affected by nest and egg destruction, this activity has no long-term effect on breeding adult birds. This method is used by WS to inhibit nesting in an area experiencing damage due to nesting activity and is employed only at the localized level. The destruction of up to 50 active great egret nests annually by WS would occur in localized areas where nesting takes place and would not reach a level where adverse effects on great egret populations would occur. As with the lethal removal of birds, the removal of active nests must be authorized by the USFWS. Therefore, the number of active nests removed by WS annually would occur at the discretion of the USFWS.

Snowy Egret Population Impact Analysis

Snowy egrets can be observed across large portions of the U.S. in both freshwater and saltwater wetland habitats, as well as flooded agricultural fields (Billerman et al. 2020). Highly social birds, snowy egrets nest colonially once a year alongside other wading bird species (Billerman et al. 2020). Birds will also forage and migrate with other wading birds (Billerman et al. 2020). Historic peak counts of these birds in the Commonwealth (during the non-breeding season) number in the thousands (Rottenborn and Brinkley 2007). In the Commonwealth's 2018 colonial waterbird survey, colonies ranged in size from 2 to 522 pairs (Watts et al. 2019).

According to BBS trend data, snowy egret populations in the Eastern U.S. BBS survey region have decreased 0.56% annually from 1966-2015 but increased 0.50% annually from 2005-2015 (Sauer et al. 2017). The number of snowy egrets observed in the Commonwealth during the CBC has shown a declining trend since 1966 (National Audubon Society 2010). There were an estimated 893 breeding pairs (1,786 birds) nesting in the Commonwealth during the 2018 breeding season (Watts et al. 2019). The population of breeding snowy egrets in BCR 14 and 30 is estimated at 372 and 15,402 breeding birds

respectively (MANEM 2006) while the breeding population in BCR 27 and 29 is estimated at 13,600 and 200 birds respectively (Hunter et al. 2006). The North American population is estimated at >143,000 breeding birds (Kushlan et al. 2002). These estimates do not reflect non-breeding birds that may be present in these areas during the breeding season. These birds are included on USFWS's regional list of bird species of concern (Appendix D).

Although lethal removal was authorized, no snowy egrets or active snowy egret nests were lethally removed by WS or other entities to alleviate damage and threats in Virginia from 2011 to 2017. WS dispersed an average of 5 snowy egrets on an annual basis during this period to alleviate damage and threats.

Direct, Indirect, and Cumulative Effects:
Based on previous requests for assistance and in anticipation of an increase in the number of requests for assistance, WS could lethally remove up to 20 snowy egrets and remove or destroy up to 20 active snowy egret nests annually under the proposed action / no action alternative to manage damage or threats of damage.

Based on the best available information, the lethal removal of up to 20 snowy egret annually by WS would represent 1.1% of Virginia's breeding population (1,786 birds), 0.07% of BCR 14, 27, 29 and 30's population (29,574 birds) or alternatively <0.01% of North America's breeding population (>143,000 birds). From 2011 to 2017, no snowy egrets were lethally removed in the Commonwealth. If this lethal removal is reflective of future lethal removal by *other* entities, the annual cumulative lethal removal by *all* entities under the proposed action alternative could be estimated at 20 birds. Given the limited magnitude of lethal removal proposed by WS when compared to the estimated population, WS' proposed lethal removal should not have any significant direct or cumulative impact on snowy egret populations. Lethal removal of snowy egrets can only occur at the discretion of the USFWS. The USFWS ensures lethal removal occurs to achieve desired objectives. WS would report the number of snowy egrets lethally removed annually to the USFWS.

Additionally, impacts due to the destruction of active nests should have little adverse impact on the snowy egret population. Many bird species can identify areas with regular human disturbance and low reproductive success, relocating and nesting elsewhere when confronted with repeated nest failure. Although there may be reduced fecundity for the individuals affected by nest and egg destruction, this activity has no long-term effect on breeding adult birds. This method is used by WS to inhibit nesting in an area experiencing damage due to nesting activity and is employed only at the localized level. The destruction of up to 20 active snowy egret nests annually by WS would occur in localized areas where nesting takes place and would not reach a level where adverse effects on snowy egret populations would occur. As with the lethal removal of birds, the removal of active nests must be authorized by the USFWS. Therefore, the number of active nests removed by WS annually would occur at the discretion of the USFWS.

Little Blue Heron Population Impact Analysis

In the U.S., observations of little blue herons are primarily restricted to the Southeastern U.S. and Atlantic coasts (Billerman et al. 2020). Preferred habitat includes both freshwater and saltwater wetland habitats, as well as flooded agricultural fields (Billerman et al. 2020). Little blue herons are social birds both nesting colonially with, foraging with and migrating with other wading birds (Billerman et al. 2020, Billerman et al. 2020). Historic peak counts of these birds in the Commonwealth (during the breeding season) number over a thousand with more recent peak counts ranging from 200 to 300 individuals (Rottenborn and Brinkley 2007). In 2018, the Commonwealth's largest colony contained 36 nesting pairs (Watts et al. 2019).

According to BBS trend data, little blue heron populations in the Eastern U.S. BBS survey region have decreased 2.64% annually from 1966-2015 and 2.33% annually from 2005-2015 (Sauer et al. 2017). The number of little blue herons observed in the Commonwealth during the CBC has shown a declining trend since 1966 (National Audubon Society 2010). There were an estimated 64 breeding pairs (128 birds) nesting in the Commonwealth during the 2018 breeding season (Watts et al. 2019). The population of breeding little blue herons in BCR 14 and 30 is estimated at 18 and 3,546 breeding birds respectively (MANEM 2006) while the breeding population in BCR 27, 28 and 29 is estimated at 15,300, 400 and 400 birds respectively (Hunter et al. 2006). The North American population is estimated at 200,000 to 300,000 breeding birds (Kushlan et al. 2002) and 225,000 to 300,000 birds (Wetlands International 2012). These estimates do not reflect non-breeding birds that may be present in these areas during the breeding season.

Although lethal removal was authorized, no little blue herons or active little blue heron nests were lethally removed by WS or other entities to alleviate damage and threats in Virginia from 2011 to 2017. WS did not disperse any little blue herons during this time to alleviate damage and threats.

Direct, Indirect, and Cumulative Effects:
Based on previous requests for assistance and in anticipation of an increase in the number of requests for assistance, WS could lethally remove up to 20 little blue herons and remove or destroy up to 10 active little blue heron nests annually under the proposed action / no action alternative to manage damage or threats of damage.

Based on the best available information, the lethal removal of up to 20 little blue heron annually by WS would represent 15.6% of Virginia's breeding population (128 birds), 0.1% of BCR 14, 27, 28, 29 and 30's population (19,664 birds) or alternatively 0.01 to 0.006% of estimates of North America's population (200,000 to 300,000 birds). From 2011 to 2017, no little blue herons were lethally removed in the Commonwealth. If this lethal removal is reflective of future lethal removal by *other* entities, the annual cumulative lethal removal by *all* entities under the proposed action alternative could be estimated at 20 birds. These estimates don't include non-breeding birds. The number of birds present in Virginia fluctuates throughout the year. Those birds nesting in more northern latitudes are the same birds present in Virginia during the non-breeding season. Given the limited magnitude of lethal removal proposed by WS when compared to the estimated population which may be present in the Commonwealth during the non-breeding season, WS' proposed lethal removal should not have any significant direct or cumulative impact on little blue heron populations. Lethal removal of little blue herons can only occur at the discretion of the USFWS. The USFWS ensures lethal removal occurs to achieve desired objectives. WS would report the number of little blue herons lethally removed annually to the USFWS.

Additionally, impacts due to the destruction of active nests should have little adverse impact on the little blue heron population. Many bird species can identify areas with regular human disturbance and low reproductive success, relocating and nesting elsewhere when confronted with repeated nest failure. Although there may be reduced fecundity for the individuals affected by nest and egg destruction, this activity has no long-term effect on breeding adult birds. This method is used by WS to inhibit nesting in an area experiencing damage due to nesting activity and is employed only at the localized level. The destruction of up to 10 active little blue heron nests annually by WS would occur in localized areas where nesting takes place and would not reach a level where adverse effects on little blue heron populations would occur. As with the lethal removal of birds, the removal of active nests must be authorized by the USFWS. Therefore, the number of active nests removed by WS annually would occur at the discretion of the USFWS.

Cattle Egret Population Impact Analysis

Cattle egrets arrived in the Western Hemisphere during modern times with the first reports coming from South America in the late 1800s (Hunter et al. 2006, Billerman et al. 2020). Their population expanded northward, and cattle egrets can now be found throughout the U.S. (Hunter et al. 2006, Billerman et al. 2020). Cattle egrets were first observed nesting in the Commonwealth in 1961 (Watts and Paxton 2009). Unlike other wading birds cattle egrets preferred habitat is agricultural fields and to a lesser extent both freshwater and saltwater habitat (MANEM 2006, Billerman et al. 2020). Cattle egrets flock throughout the year, roosting, flying, foraging and nesting colonially (with other wading birds) in large numbers (Billerman et al. 2020). The historic peak count for these birds in the Commonwealth in the fall is greater than 600 birds (1988) (Rottenborn and Brinkley 2007).

According to BBS trend data, cattle egret populations in the Eastern U.S. BBS survey region have decreased 3.28% annually from 1966-2015 and 2.43% annually from 2005-2015 (Sauer et al. 2017). The number of cattle egrets observed in the Commonwealth during the CBC has shown a declining trend since 1966 (National Audubon Society 2010). There were an estimated 48 breeding pairs (96 birds) nesting in the Commonwealth during the 2018 breeding season (Watts et al. 2019). The population of breeding cattle egrets in BCR 14 and 30 is estimated at 2 and 10,328 breeding birds respectively (MANEM 2006) while the breeding population in BCR 27, 28 and 29 is estimated at113,652, 1,400 and 2,100 birds respectively (Hunter et al. 2006). The North American population is estimated at >750,000 to 1,500,000 total birds (MANEM 2006) and 10 million birds (Wetlands International 2012). These estimates do not reflect non-breeding birds.

The number of cattle egrets lethally removed by WS or other entities to alleviate damage and threats in Virginia from 2011 to 2017 is shown in Table 3.28. No active cattle egret nests were destroyed during this time. WS dispersed an average of 16 cattle egrets on an annual basis from 2011 to 2017 to alleviate damage and threats.

Table 3.28 – Number of cattle egrets addressed in Virginia from 2011 to 2017

	Removal Under Depredation Permits		
Year	**Authorized Lethal Removal[a]**	**WS' Lethal Removal[bc]**	**Total Lethal Removal by All Entities[ad]**
2011	200	2	2
2012	200	5	5
2013	225	0	1
2014	225	1	1
2015	235	1	0
2016	235	0	0
2017	235	1	1
AVERAGE	**222**	**1**	**1**

[a]Data reported by calendar year, obtained from USFWS's Service Permit Issuance and Tracking System (SPITS) system, A. McCollum, USFWS, personal communication, 2018
[b]Data reported by federal fiscal year, obtained from WS' Management Information System (MIS) system
[c]WS' removal conducted under depredation permits issued to WS and other entities where WS is a subpermittee
[d]Includes WS' lethal removal as reported by USFWS's SPITS system

Direct, Indirect, and Cumulative Effects:
Based on previous requests for assistance and in anticipation of an increase in the number of requests for assistance, WS could lethally remove up to 25 cattle egrets and remove or destroy up to 10 active cattle

egret nests annually under the proposed action / no action alternative to manage damage or threats of damage.

Based on the best available information, the lethal removal of up to 25 cattle egrets annually by WS would represent 26.0% of Virginia's breeding population (96 birds), 0.02% of BCR 14, 27, 28, 29 and 30's population (127,482 birds) or alternatively <0.003 to 0.0003% of estimates of North America's population (>750,000 to 10,000,000 birds). From 2011 to 2017, an average of one cattle egret was lethally removed by *all* entities in the Commonwealth on an annual basis. If this lethal removal is reflective of future lethal removal by *other* entities, the annual cumulative lethal removal by *all* entities under the proposed action alternative could be estimated at 26 birds. This is equivalent to 27.1% of Virginia's breeding population, 0.04% of BCR 14, 27, 28, 29 and 30's population or alternatively <0.003 to 0.0003% of estimates of North America's population. The number of cattle egrets present in Virginia fluctuates throughout the year. Those birds nesting in more northern areas are the same birds present in Virginia during the non-breeding season. These estimates don't include non-breeding birds. Given the limited magnitude of lethal removal proposed by WS when compared to the population which may be present in the Commonwealth during the non-breeding season, WS' proposed lethal removal should not have any significant direct or cumulative impact on cattle egret populations. Lethal removal of cattle egrets can only occur at the discretion of the USFWS. The USFWS ensures lethal removal occurs to achieve desired objectives. WS would report the number of cattle egrets lethally removed annually to the USFWS.

Additionally, impacts due to the destruction of active nests should have little adverse impact on the cattle egret population. Many bird species can identify areas with regular human disturbance and low reproductive success, relocating and nesting elsewhere when confronted with repeated nest failure. Although there may be reduced fecundity for the individuals affected by nest and egg destruction, this activity has no long-term effect on breeding adult birds. This method is used by WS to inhibit nesting in an area experiencing damage due to nesting activity and is employed only at the localized level. The destruction of up to 10 active cattle egret nests annually by WS would occur in localized areas where nesting takes place and would not reach a level where adverse effects on cattle egret populations would occur. As with the lethal removal of birds, the removal of active nests must be authorized by the USFWS. Therefore, the number of active nests removed by WS annually would occur at the discretion of the USFWS.

Green Heron Population Impact Analysis

A common species, green herons can be observed across the eastern U.S. and Pacific Coast in both freshwater and saltwater habitat (Billerman et al. 2020). Like other wading birds, green herons nest colonially once per year with other species of wading birds (Billerman et al. 2020). Green herons will also roost alongside both European starlings and common grackles (Billerman et al. 2020). Although typically solitary foragers, green herons will forage alongside other waders, waterfowl, shorebirds, gulls, terns raptors and passerines (Billerman et al. 2020). In the Commonwealth, peak counts of 100 of these birds have been documented (Rottenborn and Brinkley 2007).

According to BBS trend data, green heron populations in Virginia have decreased 2.32% annually from 1966-2015 and 2.21% annually from 2005-2015 (Sauer et al. 2017). The number of green herons observed in the Commonwealth during the CBC has shown a declining trend since 1966 (National Audubon Society 2010). There were an estimated 21 breeding pairs (42 birds) nesting in 7 colonies in the Commonwealth during the 2018 breeding season (Watts et al. 2019). The population of breeding green herons in BCR 14 and 30 is estimated at 30 and 408 breeding birds respectively (MANEM 2006) while the breeding population in BCR 27, 28 and 29 is estimated at 151,800, 50,600 and 36,800 birds respectively (Hunter et al. 2006). These estimates do not reflect non-breeding birds that may be present.

The number of green herons lethally removed by WS or other entities to alleviate damage and threats in Virginia from 2011 to 2017 is shown in Table 3.29. No active green heron nests were destroyed during this time. WS dispersed an average of 5 green herons on an annual basis from 2011 to 2017 to alleviate damage and threats.

Table 3.29 – Number of green herons addressed in Virginia from 2011 to 2017

	Removal Under Depredation Permits		
Year	Authorized Lethal Removal[a]	WS' Lethal Removal[bc]	Total Lethal Removal by All Entities[ad]
2011	20	10	0
2012	20	1	1
2013	22	12	12
2014	25	6	0
2015	35	1	0
2016	35	0	0
2017	35	6	6
AVERAGE	**27**	**5**	**3**

[a]Data reported by calendar year, obtained from USFWS's Service Permit Issuance and Tracking System (SPITS) system, A. McCollum, USFWS, personal communication, 2018
[b]Data reported by federal fiscal year, obtained from WS' Management Information System (MIS) system
[c]WS' removal conducted under depredation permits issued to WS and other entities where WS is a subpermittee
[d]Includes WS' lethal removal as reported by USFWS's SPITS system

Direct, Indirect, and Cumulative Effects:
Based on previous requests for assistance and in anticipation of an increase in the number of requests for assistance, WS could lethally remove up to 30 green herons and remove or destroy up to 10 active green heron nests annually under the proposed action / no action alternative to manage damage or threats of damage.

Based on the best available information, the lethal removal of up to 30 green heron annually by WS Could represent 71.4% of Virginia's breeding population (42 birds), 0.01% of BCR 14, 27, 28, 29 and 30's population (239,638 birds). From 2011 to 2017, an average of three green herons were lethally removed by *all* entities in the Commonwealth on an annual basis. If this lethal removal is reflective of future lethal removal by *other* entities, the annual cumulative lethal removal by *all* entities under the proposed action alternative could be estimated at 33 birds. This is equivalent to 78.6% of Virginia's breeding population, 0.01% of BCR 14, 27, 28, 29 and 30's population. The number of green herons present in Virginia fluctuates throughout the year. Those birds nesting in more northern areas are the same birds present in Virginia during the non-breeding season. These estimates don't include non-breeding birds. Given the limited magnitude of lethal removal proposed by WS when compared to the estimated population which may be present in the Commonwealth during the non-breeding season, WS' proposed lethal removal should not have any significant direct or cumulative impact on green heron populations. Lethal removal of green herons can only occur at the discretion of the USFWS. The USFWS ensures lethal removal occurs to achieve desired objectives. WS would report the number of green herons lethally removed annually to the USFWS.

Additionally, impacts due to the destruction of active nests should have little adverse impact on the green heron population. Many bird species can identify areas with regular human disturbance and low reproductive success, relocating and nesting elsewhere when confronted with repeated nest failure. Although there may be reduced fecundity for the individuals affected by nest and egg destruction, this

activity has no long-term effect on breeding adult birds. This method is used by WS to inhibit nesting in an area experiencing damage due to nesting activity and is employed only at the localized level. The destruction of up to 10 active green heron nests annually by WS would occur in localized areas where nesting takes place and would not reach a level where adverse effects on green heron populations would occur. As with the lethal removal of birds, the removal of active nests must be authorized by the USFWS. Therefore, the number of active nests removed by WS annually would occur at the discretion of the USFWS.

Black-crowned Night-heron Population Impact Analysis

Black-crowned night-herons can be observed across much of the U.S., in both freshwater and saltwater habitat as well as wet agricultural fields (Billerman et al. 2020). Black-crowned night-herons nest once a year in colonies (up to 500 nests per site and often more than 12 nests per tree) and form communal roosts in winter (Billerman et al. 2020). Historic peak counts from nesting sites in the Commonwealth exceed 2,200 birds (Fisherman's Island, 1976) (Rottenborn and Brinkley 2007).

According to BBS trend data, black-crowned night-heron populations in the Eastern U.S. BBS survey region have decreased 0.88% annually from 1966-2015 but increased 3.32% annually from 2005-2015 (Sauer et al. 2017). The number of black-crowned night-herons observed in the Commonwealth during the CBC has shown a declining trend since 1966 (National Audubon Society 2010). There were an estimated 858 breeding pairs (1,716 birds) nesting in the Commonwealth during the 2018 breeding season (Watts et al. 2019). The population of breeding black-crowned night-herons in BCR 14 and 30 is estimated at 2,468 and 10,388 breeding birds respectively (MANEM 2006) while the breeding population in BCR 27, 28 and 29 is estimated at 2,666, 666 and 666 birds respectively (Hunter et al. 2006). The North American population is estimated at >50,000 breeding birds (Kushlan 2002) and 75,000 to 150,000 total birds (Wetlands International 2012). These estimates do not reflect non-breeding birds.

Although lethal removal was authorized, no black-crowned night-herons or active black-crowned night heron nests were lethally removed by WS or other entities to alleviate damage and threats in Virginia from 2011 to 2017. WS dispersed an average of less than one black-crowned night-heron on an annual basis to alleviate damage and threats during this time.

Direct, Indirect, and Cumulative Effects:
Based on previous requests for assistance and in anticipation of an increase in the number of requests for assistance, WS could lethally remove up to 20 black-crowned night-herons and remove or destroy up to 20 active black-crowned night-heron nests annually under the proposed action / no action alternative to manage damage or threats of damage.

Based on the best available information, the lethal removal of up to 20 black-crowned night-heron annually by WS would represent 1.2% of Virginia's breeding population (1,716 birds), 0.1% of BCR 14, 27, 28, 29 and 30's population (16,854 birds) or alternatively <0.04 to 0.01% of estimates of North America's population (>50,000 to 150,000 birds). From 2011 to 2017, no black-crowned night-herons were lethally removed in the Commonwealth. If this lethal removal is reflective of future lethal removal by *other* entities, the annual cumulative lethal removal by *all* entities under the proposed action alternative could be estimated at 20 birds. Given the limited magnitude of lethal removal proposed by WS when compared to the estimated population, WS' proposed lethal removal should not have any significant direct or cumulative impact on black-crowned night-heron populations. Lethal removal of black-crowned night-herons can only occur at the discretion of the USFWS. The USFWS ensures lethal removal occurs to achieve desired objectives. WS would report the number of black-crowned night-herons lethally removed annually to the USFWS.

Additionally, impacts due to the destruction of active nests should have little adverse impact on the black-crowned night-heron population. Many bird species can identify areas with regular human disturbance and low reproductive success, relocating and nesting elsewhere when confronted with repeated nest failure. Although there may be reduced fecundity for the individuals affected by nest and egg destruction, this activity has no long-term effect on breeding adult birds. This method is used by WS to inhibit nesting in an area experiencing damage due to nesting activity and is employed only at the localized level. The destruction of up to 20 active black-crowned night-heron nests annually by WS would occur in localized areas where nesting takes place and would not reach a level where adverse effects on black-crowned night-heron populations would occur. As with the lethal removal of birds, the removal of active nests must be authorized by the USFWS. Therefore, the number of active nests removed by WS annually would occur at the discretion of the USFWS.

Yellow-crowned Night-heron Population Impact Analysis

Yellow -crowned night-herons can be observed along the Atlantic and Gulf Coasts and across the Southeastern U.S. during the breeding season and in southern portions of this area year-round (Billerman et al. 2020). Birds utilize both freshwater and saltwater habitat preferring to nest in close association with human structures (i.e., over rooftops, driveways or pavement) (Billerman et al. 2020). Yellow-crowned night-herons nest once a year sometimes singly and other times in colonies (up to 1,000 nests per site) (Billerman et al. 2020). Birds will also nest or roost alongside other wading birds (Billerman et al. 2020).

According to BBS trend data, yellow-crowned night-heron populations in the Eastern U.S. BBS survey region have decreased 2.62% annually from 1966-2015 and 0.72% annually from 2005-2015 (Sauer et al. 2017). The number of yellow-crowned night-herons observed in the Commonwealth during the CBC has shown a declining trend since 1966 (National Audubon Society 2010). There were an estimated 602 breeding pairs (1,206 birds) nesting in the Commonwealth during the 2018 breeding season, the largest since regular censuses began in 1993 (Watts et al. 2019). The population of breeding yellow-crowned night-herons in BCR 30 is estimated at 1,620 breeding birds respectively (MANEM 2006) while the breeding population in BCR 27 and 28 is estimated at 1,400 and 1,400 birds respectively (Hunter et al. 2006). The breeding population of BCR 29 is unknown (Hunter et al. 2006). The North American population is estimated at 50,000 to 100,000 breeding birds (MANEM 2006) and 75,000 to 150,000 total birds (Wetlands International 2012). These estimates do not reflect non-breeding birds.

Although lethal removal was authorized, WS or other entities did not lethally remove any yellow-crowned night herons to alleviate damage and threats in Virginia from 2011 to 2017. No active yellow-crowned night-heron nests were destroyed by WS or other entities and WS did not disperse any of these birds during this time to alleviate damage and threats.

Direct, Indirect, and Cumulative Effects:
Based on previous requests for assistance and in anticipation of an increase in the number of requests for assistance, WS could lethally remove up to 20 yellow-crowned night-herons and remove or destroy up to 20 active yellow-crowned night-heron nests annually under the proposed action / no action alternative to manage damage or threats of damage.

Based on the best available information, the lethal removal of up to 20 yellow-crowned night-heron annually by WS would represent 1.7% of Virginia's breeding population (1,206 birds), 0.5% of BCR 27, 28 and 30's population (4,420 birds) or alternatively 0.04 to 0.01% of estimates of North America's population (50,000 to 150,000 birds). From 2011 to 2017, no yellow-crowned night-herons were lethally removed in the Commonwealth. If this lethal removal is reflective of future lethal removal by *other* entities, the annual cumulative lethal removal by *all* entities under the proposed action alternative could be estimated at 20 birds. Given the limited magnitude of lethal removal proposed by WS when compared

to the estimated population, WS' proposed lethal removal should not have any significant direct or cumulative impact on yellow-crowned night-heron populations. Lethal removal of yellow-crowned night-herons can only occur at the discretion of the USFWS. The USFWS ensures lethal removal occurs to achieve desired objectives. WS would report the number of yellow-crowned night-herons lethally removed annually to the USFWS.

Additionally, impacts due to the destruction of active nests should have little adverse impact on the yellow-crowned night-heron population. Many bird species can identify areas with regular human disturbance and low reproductive success, relocating and nesting elsewhere when confronted with repeated nest failure. Although there may be reduced fecundity for the individuals affected by nest and egg destruction, this activity has no long-term effect on breeding adult birds. This method is used by WS to inhibit nesting in an area experiencing damage due to nesting activity and is employed only at the localized level. The destruction of up to 20 active yellow-crowned night-heron nests annually by WS would occur in localized areas where nesting takes place and would not reach a level where adverse effects on yellow-crowned night-heron populations would occur. As with the lethal removal of birds, the removal of active nests must be authorized by the USFWS. Therefore, the number of active nests removed by WS annually would occur at the discretion of the USFWS.

Glossy Ibis Population Impact Analysis

Glossy ibis can be observed along the Atlantic and Gulf Coasts primarily in freshwater habitats (Billerman et al. 2020). However, birds can also be observed in brackish and saltwater habitats (Billerman et al. 2020). Glossy ibis are highly social birds, nesting colonially, and flying and foraging in flocks often alongside other wading birds (Billerman et al. 2020). Birds nest once per year (Billerman et al. 2020). Historically, a single site (Hog Island) in the Commonwealth hosted more than 1,200 nests (1975) (Rottenborn and Brinkley 2007). Peak counts of up to 2,500 birds have been recorded in the Commonwealth (Rottenborn and Brinkley 2007).

According to BBS trend data, glossy ibis populations in the Eastern U.S. BBS survey region have increased 4.24% annually from 1966-2015 and 8.43% annually from 2005-2015 (Sauer et al. 2017). The number of glossy ibises observed in the Commonwealth during the CBC has shown a decreasing trend since 1966 (National Audubon Society 2010). There were an estimated 366 breeding pairs (732 birds) nesting in the Commonwealth during the 2018 breeding season, a decrease of 64% from 25 years ago (Watts et al. 2019). The population of breeding glossy ibises in BCR 14 and 30 is estimated at 284 and 11,006 breeding birds respectively (MANEM 2006) while the breeding population in BCR 27 is estimated at 3,000 birds (Hunter et al. 2006). The U.S. population is estimated at 13,000 to 15,000 breeding birds (Kushlan 2002). These estimates do not reflect non-breeding birds.

The number of glossy ibises lethally removed by WS or other entities to alleviate damage and threats in Virginia from 2011 to 2017 is shown in Table 3.30. No active glossy ibis nests were destroyed during this time period. WS dispersed an average of 104 glossy ibises on an annual basis from 2011 to 2017 to alleviate damage and threats.

Table 3.30 – Number of glossy ibises addressed in Virginia from 2011 to 2017

Year	Removal Under Depredation Permits		
	Authorized Lethal Removal[a]	WS' Lethal Removal[bc]	Total Lethal Removal by All Entities[ad]
2011	75	0	0
2012	75	0	0
2013	85	0	0
2014	85	0	0
2015	95	1	3
2016	95	3	0
2017	95	0	0
AVERAGE	**86**	**<1**	**<1**

[a]Data reported by calendar year, obtained from USFWS's Service Permit Issuance and Tracking System (SPITS) system, A. McCollum, USFWS, personal communication, 2018
[b]Data reported by federal fiscal year, obtained from WS' Management Information System (MIS) system
[c]WS' removal conducted under depredation permits issued to WS and other entities where WS is a subpermittee
[d]Includes WS' lethal removal as reported by USFWS's SPITS system

Direct, Indirect, and Cumulative Effects:
Based on previous requests for assistance and in anticipation of an increase in the number of requests for assistance, WS could lethally remove up to 20 glossy ibises and remove or destroy up to 10 active glossy ibis nests annually under the proposed action / no action alternative to manage damage or threats of damage.

Based on the best available information, the lethal removal of up to 20 glossy ibis annually by WS would represent 2.7% of Virginia's breeding population (732 birds), 0.14% of BCR 14, 27 and 30's population (14,290 birds) or alternatively 0.15 to 0.13% of the U.S. population (13,000 to 15,000 birds). From 2011 to 2017, <1 glossy ibis was lethally removed by other entities in the Commonwealth on an annual basis. If this lethal removal is reflective of future lethal removal by *other* entities, the annual cumulative lethal removal by *all* entities under the proposed action alternative could be estimated at 21 birds (1 bird by other entities, 20 birds by WS). This is equivalent to 2.9% of Virginia's breeding population, 0.15% of BCR 14, 27 and 30's population or 0.16 to 0.14% of the U.S. population. The number of glossy ibis present in Virginia fluctuates throughout the year. Those birds nesting in BCR 14, 27 and 30 are the same birds present in Virginia during the non-breeding season. These estimates don't include non-breeding birds. Given the limited magnitude of lethal removal proposed by WS when compared to the estimated population which may be present in the Commonwealth during the non-breeding season, WS' proposed lethal removal should not have any significant direct or cumulative impact on glossy ibis populations. Lethal removal of glossy ibises can only occur at the discretion of the USFWS. The USFWS ensures lethal removal occurs to achieve desired objectives. WS would report the number of glossy ibises lethally removed annually to the USFWS.

Additionally, impacts due to the destruction of active nests should have little adverse impact on the glossy ibis population. Many bird species can identify areas with regular human disturbance and low reproductive success, relocating and nesting elsewhere when confronted with repeated nest failure. Although there may be reduced fecundity for the individuals affected by nest and egg destruction, this activity has no long-term effect on breeding adult birds. This method is used by WS to inhibit nesting in an area experiencing damage due to nesting activity and is employed only at the localized level. The destruction of up to 10 active glossy ibis nests annually by WS would occur in localized areas where nesting takes place and would not reach a level where adverse effects on glossy ibis populations would occur. As with the lethal removal of birds, the removal of active nests must be authorized by the USFWS.

Therefore, the number of active nests removed by WS annually would occur at the discretion of the USFWS.

Black Vulture Population Impact Analysis

Historically rare in the U.S. outside the southeast, black vultures have expanded their range into in the mid-Atlantic, mid-west and Northeastern U.S. (Billerman et al. 2020, Valery et al. 2013, BirdLife International 2018). Black vultures can be observed in virtually all habitats but are most abundant where forest is interrupted by open land (Billerman et al. 2020). Highly social birds, black vultures forage, fly and roost communally with turkey vultures in trees, and on electric poles, communications towers, buildings and other structures (Billerman et al. 2020). Communal roosting occurs year-round, even during incubation, and brooding breeding adults not attending to the nest will join roosts (Billerman et al. 2020). A single roost in Radford, Virginia was observed to have a maximum of 423 black vultures in February and March of 2004 (roost had 925 total black and turkey vultures) (Avery et al. 2006). Observations of black vultures in the Radford, Virginia area during the CBC have exceeded 700 birds on two occasions in the past five years (2014, 2017) (National Audubon Society 2018).

According to BBS trend data, black vulture populations in Virginia have increased 4.44% annually from 1966 to 2015, and 4.46% annually from 2005 to 2015 (Sauer et al. 2017). The number of black vultures observed in the Commonwealth during the CBC has shown an increasing trend since 1966 (National Audubon Society 2010). Using data from the BBS, Partners in Flight Science Committee (2019), estimated the population of black vultures in Virginia at 52,000 birds during the breeding season. However, this figure is a poor estimate. BBS survey data is derived from surveyors identifying bird species based on visual and auditory cues at stationary points. However, vultures produce very few auditory cues that would allow for identification (Billerman et al. 2020) and thus, surveying for vultures is reliant upon visual identification. For visual identification to occur during surveys vultures must be either flying or visible while roosting. However, Coleman and Fraser (1989) estimated that vultures spend only a small portion of their day (12–33% in summer, when the BBS is conducted) flying. Furthermore, Bunn et al. (1995) reported vulture activity increased from morning to afternoon as temperatures increased (and birds could find thermals for soaring), however, BBS observations are initiated in the morning. Additionally, counting these birds which roost communally, at roosts accurately would be unlikely due to the methodology of the surveys. (i.e., BBS observers are limited to counting only those birds within a quarter mile of a survey point so a roost would have to be within a quarter mile of the survey point and not have any visual obstructions to prevent an accurate count). For these reasons, vultures are under-represented in BBS data and PIF's estimate of the population derived from BBS data is poor. Using data from the BBS and other sources to correct for these limitations, Zimmerman et al. (2019) estimated the black vulture population in Virginia at 117,741 birds.

The number of black vultures lethally removed by WS or other entities to alleviate damage and threats in Virginia from 2011 to 2017 is shown in Table 3.31. On average, less than one black vulture nest was destroyed annually during this time. WS dispersed an average of 17,179 black vultures on an annual basis from 2011 to 2017.

Table 3.31 – Number of black vultures addressed in Virginia from 2011 to 2017

Year	Removal Under Depredation Permits					
	Birds			Active Nests		
	Authorized Lethal Removal[a]	WS' Lethal Removal[bc]	Total Lethal Removal by All Entities[ad]	Authorized Lethal Removal[a]	WS' Lethal Removal[bc]	Total Lethal Removal by All Entities[ad]
2011	2,415	601	518	10	0	0
2012	3,159	269	263	10	1	1
2013	3,389	110	623	10	1	0
2014	3,163	339	445	10	0	0
2015	3,470	127	575	20	0	1
2016	3,195	119	1,435	20	0	9
2017	4,200	1,143	458	20	1	3
AVERAGE	**3,284**	**387**	**617**	**14**	**<1**	**2**

[a]Data reported by calendar year, obtained from USFWS's Service Permit Issuance and Tracking System (SPITS) system, A. McCollum, USFWS, personal communication, 2018
[b]Data reported by federal fiscal year, obtained from WS' Management Information System (MIS) system
[c]WS' removal conducted under depredation permits issued to WS and other entities where WS is a subpermittee
[d]Includes WS' lethal removal as reported by USFWS's SPITS system

Direct, Indirect, and Cumulative Effects:
Based on previous requests for assistance and in anticipation of an increase in the number of requests for assistance, WS could lethally remove up to 5,000 black vultures and lethally remove or destroy up to 20 active black vulture nests under the proposed action / no action alternative to manage damage or threats of damage.

Based on the best available information, the lethal removal of up to 5,000 black vultures annually by WS would represent 4.2% of the Virginia population (52,000 to 117,741 birds). From 2011 to 2017, an average of 617 black vultures were lethally removed by *all* entities in the Commonwealth on an annual basis. If this lethal removal is reflective of future lethal removal by *other* entities, the annual cumulative lethal removal by *all* entities under the proposed action alternative could be estimated at 5,617 birds (167 birds by other entities, 5,000 birds by WS). This is equivalent to 10.8% to 4.8% of the Virginia population. Zimmerman et al. (2019) estimated that 7,798 black vultures could be removed annually in Virginia without adversely impacting the population. The estimated annual cumulative lethal removal under the proposed action alternative (5,617 birds) is below that figure (7,798 birds). Given this, WS' proposed lethal removal should not have any significant direct or cumulative impact on black vulture populations. Lethal removal of black vulture can only occur at the discretion of the USFWS. The USFWS ensures lethal removal occurs to achieve desired objectives. WS would report the number of black vultures lethally removed annually to the USFWS.

Impacts due to the destruction of active nests should have little adverse impact on the black vulture population. Many bird species can identify areas with low reproductive success, relocating and nesting elsewhere when confronted with nest failure (Lima 2009). Although there may be reduced fecundity (number of offspring produced) for the individuals affected by nest and egg destruction, this activity has no long-term effect on breeding adult birds. This method is used by WS to inhibit nesting in an area experiencing damage due to nesting activity and is employed only at the localized level. The destruction of up to 20 active black vulture nests annually by WS would occur in localized areas where nesting takes place and would not reach a level where adverse effects on black vulture populations would occur. As with the lethal removal of birds, the removal of active nests must be authorized by the USFWS. Therefore, the number of active nests removed by WS annually would occur at the discretion of the USFWS.

Osprey Population Impact Analysis

Osprey can be observed across the U.S. during the breeding season and during periods of migration and across the Southeastern U.S. and Arizona, California and Oregon year-round (Billerman et al. 2020). Osprey select areas close to either fresh or salt water with an adequate supply of food (fish) and in the breeding season, adequate nesting locations (Billerman et al. 2020). Birds nest once per year, in trees and on made-made structures such as power poles, cell towers, navigational aids and man-made nesting platforms (Watts et al. 2004, Billerman et al. 2020). In the Chesapeake Bay, 90% of 3,500 nests were constructed on artificial structures (Watts and Paxton 2007). In pristine habitat birds may nest in close proximity to one another (30 feet apart) (Billerman et al. 2020). During the non-breeding season birds may congregate (6 to 10 individuals) at feeding and roosting sites and larger congregations may occur during migration (Billerman et al. 2020). As many as 1,053 osprey have been observed on a single day during fall migration at the Kiptopeke Hawkwatch site on Virginia's Eastern Shore (HMANA 2018).

According to BBS trend data, osprey populations in Virginia have increased 5.39% annually from 1966-2015, and 5.59% annually from 2005-2015 (Sauer et al. 2017). The number of osprey observed in the Commonwealth during the CBC has shown an increasing trend since 1966 (National Audubon Society 2010). The population of osprey in the Commonwealth during the breeding season is estimated at 6,700 birds (Partners in Flight Science Committee 2019). Watts and Paxton (2007) used data from a systematic survey to estimate the population of osprey in the Chesapeake Bay (the world's largest breeding population) at 7,000 breeding birds with more recent data collected by the same authors suggesting a population of at least 12,000 breeding birds (VDGIF 2010). The population of osprey in the U.S. and Canada is estimated at 400,000 birds (Partners in Flight Science Committee 2019).

The number of osprey or active osprey nests lethally removed by WS or other entities to alleviate damage and threats in Virginia from 2011 to 2017 is shown in Table 3.32. WS dispersed an average of 327 osprey on an annual basis during this time period.

Table 3.32 – Number of osprey addressed in Virginia from 2011 to 2017

	Removal Under Depredation Permits					
	Birds			Active Nests		
Year	Authorized Lethal Removal[ab]	WS' Lethal Removal[cd]	Total Lethal Removal by All Entities[aef]	Authorized Lethal Removal[ab]	WS' Lethal Removal[cd]	Total Lethal Removal by All Entities[aef]
2011	150	24	24	75	3	4
2012	157	44	45	93	5	0
2013	170	29	32	58	4	6
2014	180	45	53	88	7	12
2015	197	39	43	120	9	23
2016	197	37	13	131	2	5
2017	197	19	18	163	1	21
AVERAGE	**178**	**34**	**33**	**104**	**4**	**10**

[a]Data reported by calendar year, obtained from USFWS's Service Permit Issuance and Tracking System (SPITS) system, A. McCollum, USFWS, personal communication, 2018
[b]Includes birds authorized to be killed subsequent to capture if relocation is not possible
[c]Data reported by federal fiscal year, obtained from WS' Management Information System (MIS) system
[d]WS' removal conducted under depredation permits issued to WS and other entities where WS is a subpermittee
[e]Includes WS' lethal removal as reported by USFWS's SPITS system
[f]Includes birds that were reported as being captured and relocated or killed (if relocation was not possible) by USFWS's SPITS system

Direct, Indirect, and Cumulative Effects:
Based on previous requests for assistance and in anticipation of an increase in the number of requests for assistance, WS could lethally remove up to 125 osprey and lethally remove or destroy up to 100 active osprey nests annually under the proposed action / no action alternative to manage damage or threats of damage.

Based on the best available information, the lethal removal of up to 125 osprey annually by WS would represent 1.86 to 1.04% of the breeding population in Virginia (6,700 to 12,000 birds) or alternatively, 0.03% of the breeding population in the U.S. and Canada (400,000 birds). From 2011 to 2017, an average of 33 osprey were lethally removed by *all* entities in the Commonwealth on an annual basis. If this lethal removal is reflective of future lethal removal by *other* entities, the annual cumulative lethal removal by *all* entities under the proposed action alternative could be estimated at 158 birds (33 birds by other entities, 125 birds by WS). This is equivalent to 2.35 to 1.31% of the population of breeding birds in Virginia or 0.03% of the population of breeding birds in the U.S. and Canada. These estimates don't include non-breeding birds. Given the limited magnitude of lethal removal proposed by WS when compared to the estimated breeding population, WS' proposed lethal removal should not have any significant direct or cumulative impact on osprey populations. Lethal removal of osprey can only occur at the discretion of the USFWS. The USFWS ensures lethal removal occurs to achieve desired objectives. WS would report the number of osprey lethally removed annually to the USFWS.

Impacts due to the destruction of active nests should have little adverse impact on the osprey population. Many bird species can identify areas with low reproductive success, relocating and nesting elsewhere when confronted with nest failure (Lima 2009). Although there may be reduced fecundity (number of offspring produced) for the individuals affected by nest and egg destruction, this activity has no long-term effect on breeding adult birds. This method is used by WS to inhibit nesting in an area experiencing damage due to nesting activity and is employed only at the localized level. The destruction of up to 100 active osprey nests annually by WS would occur in localized areas where nesting takes place and would not reach a level where adverse effects on osprey populations would occur. As with the lethal removal of birds, the removal of active nests must be authorized by the USFWS. Therefore, the number of active nests removed by WS annually would occur at the discretion of the USFWS.

Mississippi Kite Population Impact Analysis

Mississippi kites can be observed in the Southern U.S. during the breeding season and during periods of migration (Billerman et al. 2020). In Virginia, the number of records of these birds has increased and observations made in 2016 during the Virginia Breeding Bird Atlas indicate that breeding is now occurring in the state (Peele 2016). The preferred habitat of Mississippi kites varies considerably (Billerman et al. 2020). They can be observed in mature riparian woodlands and bottomland forests which are fragmented with adjacent open habitat (Billerman et al. 2020). However, they can also be observed in agricultural, prairie or shrub habitat interspersed with shelterbelts or woodland as well as in suburban and urban areas (Billerman et al. 2020). Social birds, Mississippi kites can be observed roosting, foraging, and migrating in groups (Billerman et al. 2020). Birds may also nest (once per year) in groups of up to 100 individuals (>40 nests) (Billerman et al. 2020).

According to BBS trend data, Mississippi kite populations in the Eastern BBS Survey Region have increased 6.35% annually from 1966-2015, and 7.76% annually from 2005-2015 (Sauer et al. 2017). No trend data from the BBS in Virginia is available (Sauer et al. 2017). Mississippi Kites have not been observed during the CBC in the Commonwealth (National Audubon Society 2010). The population of Mississippi kites in the Commonwealth during the breeding season is estimated at 1,100 birds while the U.S. and Canadian population is estimated at 700,000 birds (Partners in Flight Science Committee 2019).

Although lethal removal was authorized, no Mississippi kites were lethally removed by WS or other entities to alleviate damage and threats in Virginia from 2011 to 2017. Additionally, no active Mississippi kite nests were destroyed, nor were any Mississippi kites dispersed during this time.

Direct, Indirect, and Cumulative Effects:
In anticipation of requests for assistance, WS could lethally remove up to 20 Mississippi kites and lethally remove or destroy up to 20 active Mississippi kite nests annually under the proposed action / no action alternative to manage damage or threats of damage.

Based on the best available information, the lethal removal of up to 20 Mississippi kites annually by WS would represent 1.8% of the Commonwealth's population (1,100 birds) or 0.003% of the population of the U.S. and Canada (700,000 birds). From 2011 to 2017, no Mississippi kites were lethally removed in the Commonwealth. If this lethal removal is reflective of future lethal removal by *other* entities, the annual cumulative lethal removal by *all* entities under the proposed action alternative could be estimated at 20 birds. Given the limited magnitude of lethal removal proposed by WS when compared to the estimated population, WS' proposed lethal removal should not have any significant direct or cumulative impact on Mississippi kite populations. Lethal removal of Mississippi kites can only occur at the discretion of the USFWS. The USFWS ensures lethal removal occurs to achieve desired objectives. WS would report the number of Mississippi kites lethally removed annually to the USFWS.

Impacts due to the destruction of active nests should have little adverse impact on the Mississippi kite population. Many bird species can identify areas with low reproductive success, relocating and nesting elsewhere when confronted with nest failure (Lima 2009). Although there may be reduced fecundity (number of offspring produced) for the individuals affected by nest and egg destruction, this activity has no long-term effect on breeding adult birds. This method is used by WS to inhibit nesting in an area experiencing damage due to nesting activity and is employed only at the localized level. The destruction of up to 20 active Mississippi kite nests annually by WS would occur in localized areas where nesting takes place and would not reach a level where adverse effects on Mississippi kite populations would occur. As with the lethal removal of birds, the removal of active nests must be authorized by the USFWS. Therefore, the number of active nests removed by WS annually would occur at the discretion of the USFWS.

Northern Harrier Population Impact Analysis

Northern harriers can be observed across most of the U.S., Canada and Mexico in marshes, wet meadows, fields and other open habitat (Billerman et al. 2020). Birds nest once per year (Billerman et al. 2020). Usually solitary birds, northern harriers may congregate at communal roosts of up to 85 individuals, sometimes with other raptors (short-eared owls, merlins, and American kestrels) during the non-breeding season (Billerman et al. 2020). In the Commonwealth, as many as 119 have been observed on a single day and as many as 1,697 have been observed during a single season during fall migration at the Kiptopeke Hawkwatch cite on Virginia's Eastern Shore (HMANA 2018). Additionally, up to 18 northern harriers were observed during a single survey in 2018 at an airport in the state's piedmont region (survey methodology is similar to BBS). Harriers were observed on 48% of these surveys (n=48) and of those surveys 48% included observations of >5 birds (R. Stewart, USDA WS, personal communication, 2019).

According to BBS trend data, populations in the Eastern BBS survey region have decreased 2.07% annually from 1966-2015, and 1.30% annually from 2005-2015 (Sauer et al. 2017). No trend data from the BBS in Virginia is available (Sauer et al. 2017). The number of northern harriers observed in the Commonwealth during the CBC has shown a decreasing trend since 1966 (National Audubon Society 2010). The Partners in Flight Science Committee (2019) estimates that the population of northern harriers in the Commonwealth during the breeding season at 46 birds. PIF's estimate of the population derived

from BBS data is poor. The Commonwealth of Virginia has 1.5 million acres of wetlands (NRCS 2013) and includes large portions of the Chesapeake Bay, the largest estuary in the U.S. (NOAA 2018). However, these areas, which are the preferred habitat of northern harriers, are often remote, and not generally bisected by or adjacent to roads and therefore not surveyed by the BBS so breeding is not frequently detected (Watts and Rottenborn 2001). (BBS observers are limited to counting birds observed within a quarter mile of survey points which are located on roads). Additionally, BBS survey data is dependent on observer's identification of birds based on visual and auditory cues. However, northern harriers produce very few auditory cues and are cryptic by nature which makes them less likely to be identified during BBS surveys. Therefore, an estimate of the population of northern harriers in Virginia during the breeding season based solely on data derived from the BBS would be expected to be poor. The numbers of these birds addressed across the state by WS and other entities support this (Table 3.33). The population of the U.S. and Canada is estimated to be 820,000 birds (Partners in Flight Science Committee 2019).

The number of northern harriers lethally removed by WS or other entities to alleviate damage and threats in Virginia from 2011 to 2017 is shown in Table 3.33. No northern harrier nests were destroyed during this time. WS dispersed an average of 304 northern harriers on an annual basis from 2011 to 2017 to alleviate damage and threats.

Table 3.33 – Number of northern harriers addressed in Virginia from 2011 to 2017

Year	Removal Under Depredation Permits		
	Authorized Lethal Removal[ab]	WS' Lethal Removal[cd]	Total Lethal Removal by All Entities[aef]
2011	162	51	17
2012	167	53	68
2013	197	91	15
2014	194	67	10
2015	225	60	10
2016	225	44	28
2017	239	28	25
AVERAGE	**201**	**56**	**25**

[a]Data reported by calendar year, obtained from USFWS's Service Permit Issuance and Tracking System (SPITS) system, A. McCollum, USFWS, personal communication, 2018
[b]Includes birds authorized to be killed subsequent to capture if relocation is not possible
[c]Data reported by federal fiscal year, obtained from WS' Management Information System (MIS) system
[d]WS' removal conducted under depredation permits issued to WS and other entities where WS is a subpermittee
[e]Includes WS' lethal removal as reported by USFWS's SPITS system
[f]Includes birds that were reported as being captured and relocated or killed (if relocation was not possible) by USFWS's SPITS system

Direct, Indirect, and Cumulative Effects:
Based on previous requests for assistance and in anticipation of an increase in the number of requests for assistance, WS could lethally remove up to 150 northern harriers and lethally remove or destroy up to 20 active northern harrier nests annually under the proposed action / no action alternative to manage damage or threats of damage.

Based on the best available information, the lethal removal of up to 150 northern harriers annually by WS would represent 0.02% of the population of the U.S. and Canada (820,000). From 2011 to 2017, 25 northern harriers were lethally removed on an annual basis by all entities in the Commonwealth. If this lethal removal is reflective of future lethal removal by *other* entities, the annual cumulative lethal removal

by *all* entities under the proposed action alternative could be estimated at 175 birds (150 birds by WS, 25 birds by other entities). This is equivalent to 0.02% of the population of the U.S. and Canada. This is estimate does not include non-breeding birds. The number of northern harriers present in Virginia fluctuates throughout the year. The number of birds present increases during migration. Given the limited magnitude of lethal removal proposed by WS when compared to the estimated population of the U.S. and Canada, WS' proposed lethal removal should not have any significant direct or cumulative impact on northern harrier populations. Northern harriers are not listed or being considered for listing by the USFWS or the Commonwealth of Virginia nor are they included on USFWS's regional list of bird species of concern (Appendix D). Lethal removal of northern harriers can only occur at the discretion of the USFWS. The USFWS ensures lethal removal occurs to achieve desired objectives. WS would report the number of northern Harriers lethally removed annually to the USFWS.

Impacts due to the destruction of active nests should have little adverse impact on the northern harrier population. Many bird species can identify areas with low reproductive success, relocating and nesting elsewhere when confronted with nest failure (Lima 2009). Although there may be reduced fecundity (number of offspring produced) for the individuals affected by nest and egg destruction, this activity has no long-term effect on breeding adult birds. This method is used by WS to inhibit nesting in an area experiencing damage due to nesting activity and is employed only at the localized level. The destruction of up to 20 active northern harrier nests annually by WS would occur in localized areas where nesting takes place and would not reach a level where adverse effects on northern harrier populations would occur. As with the lethal removal of birds, the removal of active nests must be authorized by the USFWS. Therefore, the number of active nests removed by WS annually would occur at the discretion of the USFWS.

Sharp-shinned Hawk Population Impact Analysis

Sharp-shinned hawks can be observed across most of the U.S. and Canada in a variety of habitats (Billerman et al. 2020). Birds nest once per year (Billerman et al. 2020). Usually solitary birds, sharp-shinned hawks will migrate in small groups (Billerman et al. 2020). As many as 3,842 sharp-shinned hawks have been observed on a single day and as many as 8,414 have been observed during a single season during fall migration at the Kiptopeke Hawkwatch site on Virginia's Eastern Shore (HMANA 2018).

According to BBS trend data, sharp-shinned hawk populations in Virginia have increased 1.22% annually from 1966-2015, and 0.98% annually from 2005-2015 (Sauer et al. 2017). The number of sharp-shinned hawks observed in the Commonwealth during the CBC has shown an increasing trend since 1966 (National Audubon Society 2010). The population of sharp-shinned hawks in the Commonwealth during the breeding season is estimated at 1,500 birds while the U.S. and Canadian population is estimated at 410,000 birds (Partners in Flight Science Committee 2019).

The number of sharp-shinned hawks lethally removed by WS or other entities to alleviate damage and threats in Virginia from 2011 to 2017 is shown in Table 3.34. No active sharp-shinned hawk nests were destroyed during this period. WS dispersed an average of five sharp-shinned hawks on an annual basis from 2011 to 2017 to alleviate damage and threats.

Table 3.34 – Number of sharp-shinned hawks addressed in Virginia from 2011 to 2017

Year	Removal Under Depredation Permits		
	Authorized Lethal Removal[ab]	WS' Lethal Removal[cd]	Total Lethal Removal by All Entities[aef]
2011	60	6	5
2012	35	3	2
2013	65	2	2
2014	75	3	2
2015	80	5	11
2016	80	7	10
2017	95	7	3
AVERAGE	**70**	**5**	**5**

[a]Data reported by calendar year, obtained from USFWS's Service Permit Issuance and Tracking System (SPITS) system, A. McCollum, USFWS, personal communication, 2018
[b]Includes birds authorized to be killed subsequent to capture if relocation is not possible
[c]Data reported by federal fiscal year, obtained from WS' Management Information System (MIS) system
[d]WS' removal conducted under depredation permits issued to WS and other entities where WS is a subpermittee
[e]Includes WS' lethal removal as reported by USFWS's SPITS system
[f]Includes birds that were reported as being captured and relocated or killed (if relocation was not possible) by USFWS's SPITS system

Direct, Indirect, and Cumulative Effects:
Based on previous requests for assistance and in anticipation of an increase in the number of requests for assistance, WS could lethally remove up to 50 sharp-shinned hawks and lethally remove or destroy up to 20 active sharp-shinned hawk nests annually under the proposed action / no action alternative to manage damage or threats of damage.

Based on the best available information, the lethal removal of up to 50 sharp-shinned hawks annually by WS would represent 3.3% of the Virginia population (1,500 birds) or 0.01% of the population of the U.S. and Canada (410,000 birds). From 2011 to 2017, an annual average of five sharp-shinned hawks were lethally removed by all entities in the Commonwealth. If this lethal removal is reflective of future lethal removal by *other* entities, the annual cumulative lethal removal by *all* entities under the proposed action alternative could be estimated at 55 birds (5 birds by other entities, 50 by WS). This is equivalent to 3.7% of the Virginia population or 0.01% of the population in the U.S. and Canada. The number of sharp-shinned hawks present in Virginia fluctuates throughout the year. Birds nesting in more northern latitudes are the same birds that migrate through and can be observed in the Commonwealth during the non-breeding season. Given the limited magnitude of lethal removal proposed by WS when compared to population estimates, WS' proposed lethal removal should not have any significant direct or cumulative impact on sharp-shinned hawk populations. Lethal removal of sharp-shinned hawks can only occur at the discretion of the USFWS. The USFWS ensures lethal removal occurs to achieve desired objectives. WS would report the number of sharp-shinned hawks lethally removed annually to the USFWS.

Impacts due to the destruction of active nests should have little adverse impact on the sharp-shinned hawk population. Many bird species can identify areas with low reproductive success, relocating and nesting elsewhere when confronted with nest failure (Lima 2009). Although there may be reduced fecundity (number of offspring produced) for the individuals affected by nest and egg destruction, this activity has no long-term effect on breeding adult birds. This method is used by WS to inhibit nesting in an area experiencing damage due to nesting activity and is employed only at the localized level. The destruction of up to 20 active sharp-shinned hawk nests annually by WS would occur in localized areas where nesting

takes place and would not reach a level where adverse effects on sharp-shinned hawk populations would occur. As with the lethal removal of birds, the removal of active nests must be authorized by the USFWS. Therefore, the number of active nests removed by WS annually would occur at the discretion of the USFWS.

Red-tailed Hawk Population Impact Analysis

Red-tailed hawks can be observed across most of the U.S. including Virginia year-round in open to semi-open habitats (Billerman et al. 2020). Birds nest once per year and are typically observed singly or in pairs, flocking during migration (Billerman et al. 2020). As many as 751 red-tailed hawks have been observed on a single day and as many as 2,100 have been observed during a single season during fall migration at the Rockfish Gap Hawk Watch site in Waynesboro Virginia (HMANA 2018).

According to BBS trend data, red-tailed hawk populations in Virginia have increased 1.76% annually from 1966-2015, and 0.88% annually from 2005-2015 (Sauer et al. 2017). The number of red-tailed hawks observed in the Commonwealth during the CBC has shown an increasing trend since 1966 (National Audubon Society 2010). The population of red-tailed hawks in the Commonwealth during the breeding season is estimated at 11,000 birds while the population of the U.S. and Canada is estimated at 2.8 million birds (Partners in Flight Science Committee 2019).

The number of red-tailed hawks lethally removed by WS or other entities to alleviate damage and threats in Virginia from 2011 to 2017 is shown in Table 3.35. No active red-tailed hawk nests were destroyed during this time. WS dispersed an average of 548 red-tailed hawks on an annual basis from 2011 to 2017 to alleviate damage and threats.

Table 3.35 – Number of red-tailed hawks addressed in Virginia from 2011 to 2017

Year	Removal Under Depredation Permits		
	Authorized Lethal Removal[ab]	WS' Lethal Removal[cd]	Total Lethal Removal by All Entities[aef]
2011	227	91	21
2012	357	198	215
2013	394	168	64
2014	414	125	59
2015	472	174	270
2016	452	235	224
2017	489	225	191
AVERAGE	**401**	**174**	**149**

[a]Data reported by calendar year, obtained from USFWS's Service Permit Issuance and Tracking System (SPITS) system, A. McCollum, USFWS, personal communication, 2018
[b]Includes birds authorized to be killed subsequent to capture if relocation is not possible
[c]Data reported by federal fiscal year, obtained from WS' Management Information System (MIS) system
[d]WS' removal conducted under depredation permits issued to WS and other entities where WS is a subpermittee
[e]Includes WS' lethal removal as reported by USFWS's SPITS system
[f]Includes birds that were reported as being captured and relocated or killed (if relocation was not possible) by USFWS's SPITS system

Direct, Indirect, and Cumulative Effects:
Based on previous requests for assistance and in anticipation of an increase in the number of requests for assistance, WS could lethally remove up to 450 red-tailed hawks and lethally remove or destroy up to 20

active red-tailed hawk nests annually under the proposed action / no action alternative to manage damage or threats of damage.

Based on the best available information, the lethal removal of up to 450 red-tailed hawks annually by WS would represent 4.0% of the Virginia population (11,000) or 0.01% of the population of the U.S. and Canada (2,800,000 million) during the breeding season. From 2011 to 2017, an average of 149 red-tailed hawks were lethally removed by all entities in the Commonwealth. If this lethal removal is reflective of future lethal removal by *other* entities, the annual cumulative lethal removal by *all* entities under the proposed action alternative could be estimated at 599 birds (149 birds by other entities, 450 by WS). This is equivalent to 5.4% of the Virginia population or 0.02% of the population of the U.S. and Canada during the breeding season. The number of red-tailed hawks present in Virginia fluctuates throughout the year. Birds which nest in more northern latitudes can be observed in Virginia during the non-breeding season. Given the limited magnitude of lethal removal proposed by WS compared to population estimates, WS' proposed lethal removal should not have any significant direct or cumulative impact on red-tailed hawk populations. Lethal removal of red-tailed hawks can only occur at the discretion of the USFWS. The USFWS ensures lethal removal occurs to achieve desired objectives. WS would report the number of red-tailed hawks lethally removed annually to the USFWS.

Impacts due to the destruction of active nests should have little adverse impact on the red-tailed hawk population. Many bird species can identify areas with low reproductive success, relocating and nesting elsewhere when confronted with nest failure (Lima 2009). Although there may be reduced fecundity (number of offspring produced) for the individuals affected by nest and egg destruction, this activity has no long-term effect on breeding adult birds. This method is used by WS to inhibit nesting in an area experiencing damage due to nesting activity and is employed only at the localized level. The destruction of up to 20 active red-tailed hawk nests annually by WS would occur in localized areas where nesting takes place and would not reach a level where adverse effects on red-tailed hawk populations would occur. As with the lethal removal of birds, the removal of active nests must be authorized by the USFWS. Therefore, the number of active nests removed by WS annually would occur at the discretion of the USFWS.

Snowy Owl Population Impact Analysis

Arctic breeders which nest once a year, snowy owls can be observed during the non-breeding season across Alaska, Canada and the northern portion of the United States (Billerman et al. 2020). Preferred habitat during the non-breeding season consists of open habitat including coastlines, marshes, fields, as well as cities and towns bordered by open habitat (Billerman et al. 2020). Birds may congregate to form communal roosts in winter (Billerman et al. 2020). As many as 35 snowy owls have been observed roosting in a single field at one time (Holt and Zetterberg 2008) and as many as 100 individual snowy owls have been live-captured and relocated during a single winter from Boston's Logan Airport (Anderson 2014).

Because they are arctic breeders, no BBS data on snowy owls is available (Sauer et al. 2017). The number of snowy owls observed in the Commonwealth during the CBC has shown an increasing trend since 1966 (National Audubon Society 2010). The Partners in Flight Science Committee (2019) states that the population estimate for the number of snowy owls in the U.S. and Canada is 30,000 birds.

Although lethal removal was authorized, no snowy owls were lethally removed by WS or other entities from 2011 to 2017 to alleviate damage and threats in Virginia. No active snowy owl nests were destroyed during this period (these birds are arctic breeders). WS dispersed an average of 10 snowy owls on an annual basis from 2011 to 2017. One snowy owl was collected and transferred to a wildlife rehabber when it was injured by a collision with an aircraft in 2015.

Direct, Indirect, and Cumulative Effects:
Based on previous requests for assistance and in anticipation of an increase in the number of requests for assistance, WS could lethally remove up to 20 snowy owls annually under the proposed action / no action alternative to manage damage or threats of damage.

Based on the best available information, the lethal removal of up to 20 snowy owls annually by WS would represent 0.07% of the population of the U.S. and Canada (30,000 birds). From 2011 to 2017, no snowy owls were lethally removed in the Commonwealth. If this lethal removal is reflective of future lethal removal by *other* entities, the annual cumulative lethal removal by *all* entities under the proposed action alternative could be estimated at 20 birds. Given the limited magnitude of lethal removal proposed by WS when compared to the estimated population, WS' proposed lethal removal should not have any significant direct or cumulative impact on snowy owl populations. Lethal removal of snowy owls can only occur at the discretion of the USFWS. The USFWS ensures lethal removal occurs to achieve desired objectives. WS would report the number of snowy owls lethally removed annually to the USFWS.

Long-eared Owl Population Impact Analysis

Long-eared owls can be observed across large portions of the U.S. in dense vegetation adjacent to open forests, grasslands and shrublands (Billerman et al. 2020). Birds form communal roosts in winter of up to 100 birds, (but typically 2 to 20), sometimes along with short-eared owls (Billerman et al. 2020). These communal roosts may occur in urban areas (Szép et al. 2018).

No BBS trend data is available for long-eared owls (Sauer et al. 2017). The number of long-eared owls observed in the Commonwealth during the CBC has shown an increasing trend since 1966 (National Audubon Society 2010). The Partners in Flight Science Committee (2019) estimates the population of long-eared owls in the U.S. and Canada at 38,000 birds.

Although lethal removal was authorized, no long-eared owls were lethally removed by WS or other entities from 2011 to 2017. Nor were any active long-eared owl nests destroyed during this time period. Additionally, WS did not disperse any long-eared owls from 2011 to 2017.

Direct, Indirect, and Cumulative Effects:
Based on previous requests for assistance and in anticipation of an increase in the number of requests for assistance, WS could lethally remove up to 20 long-eared owls and lethally remove or destroy up to 20 active long-eared owl nests annually under the proposed action / no action alternative to manage damage or threats of damage.

Based on the best available information, the lethal removal of up to 20 long-eared owls annually by WS would represent 0.05% of the population of the U.S. and Canada (38,000 birds). From 2011 to 2017, no long-eared owls were lethally removed in the Commonwealth. If this lethal removal is reflective of future lethal removal by *other* entities, the annual cumulative lethal removal by *all* entities under the proposed action alternative could be estimated at 20 birds. Given the limited magnitude of lethal removal proposed by WS when compared to the estimated population, WS' proposed lethal removal should not have any significant direct or cumulative impact on long-eared owl populations. Lethal removal of long-eared owls can only occur at the discretion of the USFWS. The USFWS ensures lethal removal occurs to achieve desired objectives. WS would report the number of long-eared owls lethally removed annually to the USFWS.

Impacts due to the destruction of active nests should have little adverse impact on the long-eared owl population. Many bird species can identify areas with low reproductive success, relocating and nesting

elsewhere when confronted with nest failure (Lima 2009). Although there may be reduced fecundity (number of offspring produced) for the individuals affected by nest and egg destruction, this activity has no long-term effect on breeding adult birds. This method is used by WS to inhibit nesting in an area experiencing damage due to nesting activity and is employed only at the localized level. The destruction of up to 20 active long-eared owl nests annually by WS would occur in localized areas where nesting takes place and would not reach a level where adverse effects on long-eared owl populations would occur. As with the lethal removal of birds, the removal of active nests must be authorized by the USFWS. Therefore, the number of active nests removed by WS annually would occur at the discretion of the USFWS.

Short-eared Owl Population Impact Analysis

Short-eared owls can be observed across much of the U.S. and Canada including Virginia (Billerman et al. 2020). These birds prefer open habitat, typically grasslands, but will also use open areas in woodlots, marshes, gravel pits, quarries, airports and reclaimed strip mines (Billerman et al. 2020). Birds nest once per year and once young have fledged, birds form communal roosts (Billerman et al. 2020). Communal roosts of up to 200 individuals have been documented during the non-breeding season (Billerman et al. 2020). Peak counts for these birds (up to 100 birds) in the Commonwealth occur at these communal roosts (Rottenborn and Brinkley 2007). Roosts may also include long-eared owls (Billerman et al. 2020).

According to BBS trend data, short-eared owl populations in the Eastern U.S. BBS survey region have decreased 6.47% annually from 1966-2015, and 13.48% annually from 2005-2015 (Sauer et al. 2017). The number of short-eared owls observed in the Commonwealth during the CBC has shown a decreasing trend since 1966 (National Audubon Society 2010). Although neither the CBC nor BBS are well-suited for detecting population trends in short-eared owls (Larson and Holt 2016), empirical evidence would suggest a population decline (Booms et al. 2014). The Partners in Flight Science Committee (2019) estimates that the population of short-eared owls in the U.S. and Canada is 600,000 birds. These birds are included on USFWS's regional list of bird species of concern (Appendix D).

The number of short-eared owls lethally removed by WS or other entities to alleviate damage and threats in Virginia from 2011 to 2017 is shown in Table 3.36. No active short-eared owl nests were destroyed during this time (these birds are arctic breeders). WS dispersed an average of 12 short-eared owls on an annual basis from 2011 to 2017 to alleviate damage and threats.

Table 3.36 – Number of short-eared owls addressed in Virginia from 2011 to 2017

Year	Removal Under Depredation Permits		
	Authorized Lethal Removal[ab]	WS' Lethal Removal[cd]	Total Lethal Removal by All Entities[aef]
2011	23	2	3
2012	35	5	13
2013	35	14	0
2014	45	10	0
2015	75	8	7
2016	75	7	0
2017	75	0	17
AVERAGE	**52**	**7**	**6**

[a]Data reported by calendar year, obtained from USFWS's Service Permit Issuance and Tracking System (SPITS) system, A. McCollum, USFWS, personal communication, 2018
[b]Includes birds authorized to be killed subsequent to capture if relocation is not possible

[c]Data reported by federal fiscal year, obtained from WS' Management Information System (MIS) system
[d]WS' removal conducted under depredation permits issued to WS and other entities where WS is a subpermittee
[e]Includes WS' lethal removal as reported by USFWS's SPITS system
[f]Includes birds that were reported as being captured and relocated or killed (if relocation was not possible) by USFWS's SPITS system

Direct, Indirect, and Cumulative Effects:
Based on previous requests for assistance and in anticipation of an increase in the number of requests for assistance, WS could lethally remove up to 75 short-eared owls and lethally remove or destroy up to 20 active short-eared owl nests annually under the proposed action / no action alternative to manage damage or threats of damage.

Based on the best available information, the lethal removal of up to 75 short-eared owls annually by WS would represent 0.01% of the population in the U.S. and Canada (600,000 birds). From 2011 to 2017, an average of six short-eared owls were lethally removed on an annual basis by *all* entities in the Commonwealth. If this lethal removal is reflective of future lethal removal by *other* entities, the annual cumulative lethal removal by *all* entities under the proposed action alternative could be estimated at 81 birds (6 birds by other entities, 75 by WS). This is equivalent to 0.01% of the population of the U.S. and Canada. Given the limited magnitude of lethal removal proposed by WS when compared to the estimated population, WS' proposed lethal removal should not have any significant direct or cumulative impact on short-eared owl populations. Lethal removal of short-eared owls can only occur at the discretion of the USFWS. The USFWS ensures lethal removal occurs to achieve desired objectives. WS would report the number of short-eared owls lethally removed annually to the USFWS.

Impacts due to the destruction of active nests should have little adverse impact on the short-eared owl population. Many bird species can identify areas with low reproductive success, relocating and nesting elsewhere when confronted with nest failure (Lima 2009). Although there may be reduced fecundity (number of offspring produced) for the individuals affected by nest and egg destruction, this activity has no long-term effect on breeding adult birds. This method is used by WS to inhibit nesting in an area experiencing damage due to nesting activity and is employed only at the localized level. The destruction of up to 20 active short-eared owl nests annually by WS would occur in localized areas where nesting takes place and would not reach a level where adverse effects on short-eared owl populations would occur. As with the lethal removal of birds, the removal of active nests must be authorized by the USFWS. Therefore, the number of active nests removed by WS annually would occur at the discretion of the USFWS.

Red-headed Woodpecker Population Impact Analysis

Red-headed woodpeckers can be observed across the Eastern half of the U.S. year-round in deciduous, pine and mixed species woodlands as well as suburban and urban habitat (Billerman et al. 2020). Birds nest once per year (Billerman et al. 2020). Red-headed woodpeckers spend the breeding season in pairs and may form loose flocks during migration but are otherwise solitary birds (Billerman et al. 2020). Peak counts of these birds in the Commonwealth number around 100 individuals (Rottenborn and Brinkley 2007).

According to BBS trend data, red-headed woodpecker populations in Virginia have increased 1.18% annually from 1966-2015, and 3.03% annually from 2005-2015 (Sauer et al. 2017). The number of red-headed woodpeckers observed in the Commonwealth during the CBC has shown an increasing trend since 1966 (National Audubon Society 2010). The population of red-headed woodpeckers in the Commonwealth during the breeding season is estimated to be 15,000 birds, while the U.S. and Canadian

population is estimated at 1.8 million birds (Partners in Flight Science Committee 2019). These birds are included on USFWS's regional list of bird species of concern (Appendix D).

Although lethal removal was authorized, no red-headed woodpeckers were lethally removed by WS or other entities to alleviate damage and threats in Virginia from 2011 to 2017. No active red-headed woodpecker nests were destroyed during this time. WS did not disperse any red-headed woodpeckers on an annual basis from 2011 to 2017 to alleviate damage and threats.

Direct, Indirect, and Cumulative Effects:
Based on previous requests for assistance and in anticipation of an increase in the number of requests for assistance, WS could lethally remove up to 20 red-headed woodpeckers and remove or destroy up to 20 active red-headed woodpecker nests annually under the proposed action / no action alternative to manage damage or threats of damage.

Based on the best available information, the lethal removal of up to 20 red-headed woodpeckers annually by WS would represent 0.13% of the Virginia population (15,000) or 0.001% of the population of the U.S. and Canada (1.8 million). From 2011 to 2017, no red-headed woodpeckers were lethally removed in the Commonwealth. If this lethal removal is reflective of future lethal removal by *other* entities, the annual cumulative lethal removal by *all* entities could be 20 birds. Given the limited magnitude of lethal removal proposed by WS when compared to the estimated population, WS' proposed lethal removal should not have any significant direct or cumulative impact on red-headed woodpecker populations. Lethal removal of red-headed woodpeckers can only occur at the discretion of the USFWS. The USFWS ensures lethal removal occurs to achieve desired objectives. WS would report the number of red-headed woodpeckers lethally removed annually to the USFWS.

Additionally, impacts due to the destruction of active nests should have little adverse impact on the red-headed woodpecker population. Many bird species can identify areas with regular human disturbance and low reproductive success, relocating and nesting elsewhere when confronted with repeated nest failure. Although there may be reduced fecundity for the individuals affected by nest and egg destruction, this activity has no long-term effect on breeding adult birds. This method is used by WS to inhibit nesting in an area experiencing damage due to nesting activity and is employed only at the localized level. The destruction of up to 20 active red-headed woodpecker nests annually by WS would occur in localized areas where nesting takes place and would not reach a level where adverse effects on red-headed woodpecker populations would occur. As with the lethal removal of birds, the removal of active nests must be authorized by the USFWS. Therefore, the number of active nests removed by WS annually would occur at the discretion of the USFWS.

American Kestrel Population Impact Analysis

American kestrels can be observed across most of the U.S. including Virginia year-round in open to semi-open habitats (Billerman et al. 2020). Birds typically nest once per year, but birds can successfully raise two broods per year (Billerman et al. 2020). American kestrels will congregate for foraging and will form aggregations during migration (Billerman et al. 2020). As many as 2,427 American kestrels have been observed on a single day and as many as 4,229 have been observed during a single season during fall migration at the Kiptopeke Hawkwatch site on Virginia's Eastern Shore (HMANA 2018). However, it should be noted that American kestrels migrate at altitudes >750 above ground where they are unlikely to be detected by observers (Billerman et al. 2020).

According to BBS trend data, American kestrel populations in Virginia have decreased 1.48% annually from 1966-2015 but increased 0.30% annually from 2005-2015 (Sauer et al. 2017). The number of

American kestrels observed in the Commonwealth during the CBC has shown a decreasing trend since 1966 (National Audubon Society 2010). The population of American kestrels in the Commonwealth during the breeding season is estimated to be 11,000 birds while the U.S. and Canadian population is estimated at 2.8 million birds (Partners in Flight Science Committee 2019).

The number of American kestrels lethally removed by WS or other entities to alleviate damage and threats in Virginia from 2011 to 2017 is shown in Table 3.37. No active American kestrel nests were destroyed during this time. WS dispersed an average of 419 American kestrels on an annual basis from 2011 to 2017 to alleviate damage and threats.

Table 3.37 – Number of American kestrels addressed in Virginia from 2011 to 2017

	Removal Under Depredation Permits		
Year	Authorized Lethal Removal[ab]	WS' Lethal Removal[cd]	Total Lethal Removal by All Entities[aef]
2011	351	196	134
2012	417	135	130
2013	427	169	28
2014	422	139	63
2015	532	153	39
2016	532	54	90
2017	612	108	63
AVERAGE	**470**	**136**	**78**

[a]Data reported by calendar year, obtained from USFWS's Service Permit Issuance and Tracking System (SPITS) system, A. McCollum, USFWS, personal communication, 2018
[b]Includes birds authorized to be killed subsequent to capture if relocation is not possible
[c]Data reported by federal fiscal year, obtained from WS' Management Information System (MIS) system, includes nontarget lethal removal
[d]WS' removal conducted under depredation permits issued to WS and other entities where WS is a subpermittee
[e]Includes WS' lethal removal as reported by USFWS's SPITS system
[f]Includes birds that were reported as being captured and relocated or killed (if relocation was not possible) by USFWS's SPITS system

Direct, Indirect, and Cumulative Effects:
Based on previous requests for assistance and in anticipation of an increase in the number of requests for assistance, WS could lethally remove up to 350 American kestrels and lethally remove or destroy up to 10 active American kestrel nests annually under the proposed action / no action alternative to manage damage or threats of damage.

Based on the best available information, the lethal removal of up to 350 American kestrels annually by WS would represent 3.2% of the Virginia population (11,000 birds) or 0.01% of the population of the U.S. and Canada (2.8 million). From 2011 to 2017, an average of 78 American kestrels were lethally removed on an annual basis by *all* entities in the Commonwealth. If this lethal removal is reflective of future lethal removal by *other* entities, the annual cumulative lethal removal by *all* entities under the proposed action alternative could be estimated at 428 birds (78 birds by other entities, 350 by WS). This is equivalent to 3.89% of the Virginia population or 0.02% of the population of the U.S. and Canada. The number of American kestrels in the state fluctuates throughout the year. Birds nesting at more northern latitudes are the same birds that can be observed in Virginia outside of the nesting season. Given the limited magnitude of lethal removal proposed by WS when compared to the estimated population, WS' proposed lethal removal should not have any significant direct or cumulative impact on American kestrel populations. Lethal removal of American kestrels can only occur at the discretion of the USFWS. The

USFWS ensures lethal removal occurs to achieve desired objectives. WS would report the number of American kestrels lethally removed annually to the USFWS.

Impacts due to the destruction of active nests should have little adverse impact on the American kestrel population. Many bird species can identify areas with low reproductive success, relocating and nesting elsewhere when confronted with nest failure (Lima 2009). Although there may be reduced fecundity (number of offspring produced) for the individuals affected by nest and egg destruction, this activity has no long-term effect on breeding adult birds. This method is used by WS to inhibit nesting in an area experiencing damage due to nesting activity and is employed only at the localized level. The destruction of up to 10 active American kestrel nests annually by WS would occur in localized areas where nesting takes place and would not reach a level where adverse effects on American kestrel populations would occur. As with the lethal removal of birds, the removal of active nests must be authorized by the USFWS. Therefore, the number of active nests removed by WS annually would occur at the discretion of the USFWS.

Peregrine Falcon Population Impact Analysis

One of the most widely distributed animals, peregrine falcons can be observed around the world including Virginia in a broad range of habitats (Billerman et al. 2020). Birds nest once per year on cliffs, communication or electrical towers, bridges, power plants, high rise buildings or other similar elevated structures (Mojica et al. 2012). Generally observed singly outside breeding season although some birds will maintain pair bonds or family groups through migration and into the non-breeding season (Billerman et al. 2020). As many as 364 peregrine falcons have been observed on a single day and as many as 528 have been observed during a single season during fall migration at the Kiptopeke Hawkwatch site on Virginia's Eastern Shore (HMANA 2018).

According to BBS trend data, peregrine falcon populations in all areas surveyed by the BBS have increased 2.77% annually from 1966-2015 and increased 6.74% annually from 2005-2015 (Sauer et al. 2017). No trend data from the Eastern or Virginia BBS survey regions is available (Sauer et al. 2017). The number of Peregrine falcons observed in the Commonwealth during the CBC has shown an increasing trend since 1966 (National Audubon Society 2010). In 2018, there were 32 known pairs (64 birds) nesting in the Commonwealth of Virginia (Watts and Watts 2018). The Partners in Flight Science Committee (2019) states that the population estimate for the number of peregrine falcons in the U.S. and Canada is 34,000 birds. Peregrine falcons were officially delisted from the Endangered Species Act on August 25, 1999 (Mesa 1999). However, they remain a listed species in the Commonwealth of Virginia and are included on USFWS's regional list of bird species of concern (Appendix D).

From 2011 to 2017, WS dispersed an average of 2 peregrine falcons on an annual basis to alleviate damage and threats in Virginia. Additionally, WS unintentionally live-captured 4 peregrine falcons in raptor traps (two in 2014, and one each in 2015 and 2017) during this time period. All captured peregrine falcons were released at the site of capture unharmed. Finally, one peregrine falcon was collected and transferred to a wildlife rehabber when it was injured by a collision with an aircraft in 2016. In 2018, VDWR began allowing up to 5 peregrine falcons to be live captured and removed from the wild population on an annual basis for falconry purposes (VDGIF 2019).

Direct, Indirect, and Cumulative Effects:
WS continues to receive requests for assistance associated with peregrines at airports. Under the proposed action / no action alternative, WS could employ harassment methods to manage damage or threats of damage associated with these birds. No destruction of eggs or lethal removal of birds is proposed. (Note that WS could also live-capture and relocate these birds away from airfields; for that analysis see **page 56**).

Impacts due to harassment would be beneficial, insignificant or discountable to the peregrine falcon population. These methods are used by WS to inhibit use of an area (e.g., an airport) where damage is occurring (e.g., peregrine falcon-aircraft collisions) and are employed only at the localized level. Harassment of birds from the damage area airport may be beneficial to the birds by reducing or preventing mortality resulting from collisions with aircraft. WS's use of these methods would not reach a level where any significant direct or cumulative impact on peregrine falcons would occur.

Monk Parakeet Population Impact Analysis

Native to South America, monk parakeets were introduced into the U.S. as pets (Billerman et al. 2020). Escaped or released birds have formed populations that can be observed in scattered urban and suburban areas across the U.S. (Billerman et al. 2020). In Virginia, these birds have been observed in the Tidewater area since the early 1970's and in 2005 the Virginia Avian Records Committee added Monk parakeets to the list of non-native birds maintaining self-sustaining wild populations in the state (Rottenborn and Brinkley 2007). Monk parakeets are highly social birds, feeding, loafing and nesting colonially (Billerman et al. 2020). Colonies of birds (which can number more than 100 individuals) maintain a single nest or an aggregation of nests in trees or on electric poles, communications towers, electric stations, buildings and other similar structures year-round (although wild birds in the U.S. only raise one clutch per year) (Avery and Lindsay 2016, Billerman et al. 2020).

No BBS trend data for monk parakeets is available (Sauer et al. 2017). Monk parakeets have been observed on seven occasions (total of 12 birds observed) in the Commonwealth during the CBC from 1966 to 2017 (National Audubon Society 2010). A population of 40–50 birds was recorded nesting and residing year-round in Newport News in the early 1990s (Schwab and Gwynn 1992, Rottenborn and Brinkley 2007). The Partners in Flight Science Committee (2019) estimates that there are 59,000 monk parakeets in the U.S. and Canada.

No monk parakeets were lethally removed, nor were any active monk parakeet nests destroyed by WS in Virginia from 2011 to 2017. WS did not disperse any monk parakeets during this time period. Monk parakeets are a non-native species not protected by state or federal law. Therefore, the total number of monk parakeets or active monk parakeet nests lethally removed by entities other than WS during this time period is unknown.

Direct, Indirect, and Cumulative Effects:
Based on previous requests for assistance and in anticipation of an increase in the number of requests for assistance, WS could lethally remove up to 50 monk parakeets and remove and destroy up to 20 active monk parakeet nests annually under the proposed action / no action alternative to manage damage or threats of damage.

WS' proposed lethal removal of up to 50 monk parakeets annually would represent 0.08% of the population of the U.S. and Canada (59,000 birds). Monk parakeets are a non-native species and therefore not protected by the state or federal government. Executive Order 13112 directs Federal agencies to use their programs and authorities to detect and respond rapidly to control (or eradicate) populations of invasive species. While elimination of these birds would be beneficial to the environment, WS' lethal removal under the proposed action alternative would not pose any significant direct or cumulative impacts to their populations.

Additionally, impacts due to the destruction of active nests should have little adverse impact on the monk parakeet population. This method is used by WS to inhibit nesting in an area experiencing damage due to nesting activity and is employed only at the localized level. The destruction of up to 20 active monk

parakeet nests annually by WS would occur in localized areas where nesting takes place and would not reach a level where adverse effects on monk parakeet populations would occur.

American Crow Population Impact Analysis

Apart from the extreme Southwest, American crows can be observed across the U.S. in a wide range of habitats including both natural and human modified landscapes (Billerman et al. 2020). Birds nest once per year but will re-nest if their first nesting attempt is unsuccessful (Billerman et al. 2020). American crows are social birds which may breed cooperatively (up to 12 individuals associated with a single nest) and form roosts of up to one million birds year-round (Gorenzel et al. 2000, Billerman et al. 2020). A combined American and fish crow winter roost in the Great Dismal Swamp was estimated to consist of 100,000 individuals in the 1960s (Rottenborn and Brinkley 2007).

According to BBS trend data, American crow populations in Virginia have increased 0.09% annually from 1966-2015, and 0.37% annually from 2005-2015 (Sauer et al. 2017). The number of American crows observed in the Commonwealth during the CBC has shown a decreasing trend since 1966 (National Audubon Society 2010). The Partners in Flight Science Committee (2019) estimates that the population of American crows in the Commonwealth during the breeding season is 700,000 birds and that the U.S. and Canadian population is 28 million birds.

American crows can be harvested during regulated harvest seasons; or lethally removed under depredation permits issued by USFWS or under the 50 CFR 21.43 of the MBTA. The number of American crows lethally removed by WS or other entities to alleviate damage and threats in Virginia and the number of American crows harvested by hunters from 2011 to 2017 is shown in Table 3.38. No active American crow nests were destroyed during this period. WS dispersed an average of 27,871 American crows on an annual basis from 2011 to 2017 to alleviate damage and threats.

Table 3.38 - Number of American crows addressed in Virginia from 2011 to 2017.

Year	Removal Under Depredation Permits and 50 CFR 21.43 (Blackbird Depredation Order)		Hunter Harvest[d]
	WS' Lethal Removal[a]	Total Lethal Removal by All Entities[bc]	
2011	325	0	121,625
2012	135	0	No survey conducted
2013	151	207	116,623
2014	279	0	No survey conducted
2015	350	1	116,912
2016	329	444	No survey conducted
2017	372	273	No survey conducted
AVERAGE	**277**	**132**	**118,387**

[a]Data reported by federal fiscal year, obtained from WS' Management Information System (MIS) system, includes nontarget lethal removal
[b]Data reported by calendar year, obtained from USFWS's Service Permit Issuance and Tracking System (SPITS) system, A. McCollum, USFWS, personal communication, 2018
[c]Includes WS' lethal removal as reported by USFWS's SPITS system
[d]Combined American crow and fish crow harvest, harvest of each individual species is unknown, VDGIF 2012, Kidd et al. 2014*a*, VDGIF 2016

Direct, Indirect, and Cumulative Effects:
Based on previous requests for assistance and in anticipation of an increase in the number of requests for assistance, WS could lethally remove up to 1,500 American crows and remove or destroy up to 50 active

American crow nests annually under the proposed action / no action alternative to manage damage or threats of damage.

The lethal removal of up to 1,500 American crows annually by WS would represent 0.2% of the Virginia population (700,000 birds) or 0.005% of the population of the U.S. and Canada (28 million birds). Alternatively, it would represent 1.3% of the average number of American crows harvested by hunters in Virginia on an annual basis (116,066 birds), if the population ratio of American crows to fish crows in the Commonwealth is an indication of the average number of American crows harvested annually. From 2011 to 2017, an average of 132 American crows were lethally removed by *all* entities in the Commonwealth under depredation permits and 50 CFR 21.43 on an annual basis. Although it has been legal to lethally remove American crows under 50 CFR 21.43 since 1972 (37 FR 9223), reporting was not required until 2011 (75 FR 75153-75156) and reporting is expected to be low. Therefore, 132 birds removed annually is likely a low estimate. If average annual lethal removal by *other* entities under 50 CFR 21.43 is estimated to be equal to that of the highest annual lethal removal reported (444 birds) by *all* entities, and is reflective of future lethal removal, and if average annual hunter harvest remains the same, annual cumulative removal by all entities under the proposed action alternative could be estimated at 118,010 birds (444 birds by other entities, 1,500 birds by WS, 116,066 birds by hunters). This is equivalent to 16.8% of the Virginia population or 0.42% of the population of the U.S. and Canada. WS' lethal removal would be a limited component of the overall lethal removal occurring and should not have any significant direct or cumulative impact on American crow populations. Most requests received by WS to address American crows are received from airports. Airports are restricted areas where hunting is not permitted. Therefore, WS' lethal removal of American crows is likely to occur in locations where it will not limit the ability to harvest crows. WS' lethal removal would be a limited component of the overall harvest and could be considered of low magnitude when compared to the number of crows being harvested. Lethal removal can only occur at the discretion of the USFWS and harvest can only occur within regulations established by USFWS in cooperation with VDWR. These entities ensure activities occur to achieve desired population objectives. WS would report the number of American crows lethally removed annually to the USFWS and the VDWR.

Additionally, impacts due to the destruction of active nests should have little adverse impact on the American crow population. Many bird species can identify areas with regular human disturbance and low reproductive success, relocating and nesting elsewhere when confronted with repeated nest failure. Although there may be reduced fecundity for the individuals affected by nest and egg destruction, this activity has no long-term effect on breeding adult birds. This method is used by WS to inhibit nesting in an area experiencing damage due to nesting activity and is employed only at the localized level. The destruction of up to 50 active American crow nests annually by WS would occur in localized areas where nesting takes place and would not reach a level where adverse effects on American crow populations would occur. As with the lethal removal of birds, the removal of active nests must be authorized by the USFWS. Therefore, the number of active nests removed by WS annually would occur at the discretion of the USFWS.

Fish Crow Population Impact Analysis

Fish crows can be observed along the Atlantic and Gulf Coasts as well as the in the greater Mississippi River drainage in aquatic habitats, agricultural areas, urban and suburban habitat (Billerman et al. 2020). Birds nest once per year but will re-nest if their first nesting attempt is unsuccessful (Billerman et al. 2020). Outside of the breeding season, fish crows are highly social, foraging and roosting in flocks of up to 45,000 individuals, often together with American crows (Billerman et al. 2020). Peak counts of these birds in the Commonwealth exceed 5,000 birds (Rottenborn and Brinkley 2007). A combined American and fish crow winter roost in the Great Dismal Swamp was estimated to consist of 100,000 individuals in the 1960s (Rottenborn and Brinkley 2007).

According to BBS trend data, fish crow populations in Virginia have increased 1.35% annually from 1966-2015, and 4.75% annually from 2005-2015 (Sauer et al. 2017). The number of fish crows observed in the Commonwealth during the CBC has shown a stable trend since 1966 (National Audubon Society 2010). The Partners in Flight Science Committee (2019) estimates that the population of fish crows in the Commonwealth during the breeding season is 14,000 birds and that the population in the U.S. and Canada is 470,000 birds.

Fish crows can be harvested during regulated harvest seasons; lethally removed under depredation permits issued by USFWS or under the 50 CFR 21.43 of the MBTA. The number of fish crows lethally removed by WS or other entities to alleviate damage and threats in Virginia and the number of fish crows harvested by hunters from 2011 to 2017 is shown in Table 3.39. No active fish crow nests were destroyed during this period. WS dispersed an average of 304 fish crows on an annual basis from 2011 to 2017 to alleviate damage and threats.

Table 3.39 - Number of fish crows addressed in Virginia from 2011 to 2017.

Year	Removal Under Depredation Permits and 50 CFR 21.43 (Blackbird Depredation Order)		Hunter Harvest[d]
	WS' Lethal Removal[a]	Total Lethal Removal by All Entities[bc]	
2011	9	0	121,625
2012	9	0	No survey conducted
2013	1	1	116,623
2014	13	0	No survey conducted
2015	14	0	116,912
2016	1	1	No survey conducted
2017	9	53	No survey conducted
AVERAGE	8	**8**	**118,387**

[a]Data reported by federal fiscal year, obtained from WS' Management Information System (MIS) system
[b]Data reported by calendar year, obtained from USFWS's Service Permit Issuance and Tracking System (SPITS) system, A. McCollum, USFWS, personal communication, 2018
[c]Includes WS' lethal removal as reported by USFWS's SPITS system
[d]Combined American crow and fish crow harvest, harvest of each individual species is unknown, VDGIF 2012, Kidd et al. 2014*a*, VDGIF 2016

Direct, Indirect, and Cumulative Effects:
Based on previous requests for assistance and in anticipation of an increase in the number of requests for assistance, WS could lethally remove up to 300 fish crows and remove or destroy up to 50 active fish crow nests annually under the proposed action / no action alternative to manage damage or threats of damage.

The lethal removal of up to 300 fish crows annually by WS would represent 2.1% of the Virginia population (14,000 birds) or 0.06% of the population of the U.S. and Canada (470,000 birds). Alternatively, it would represent 12.9% of the average number of fish crows harvested by hunters in Virginia on an annual basis (2,321 birds), if the population ratio of American crows to fish crows in the Commonwealth is an indication of the average number of fish crows harvested annually. From 2011 to 2017, an average of 8 fish crows were lethally removed by *all* entities in the Commonwealth under depredation permits and 50 CFR 21.43 on an annual basis. Although it has been legal to lethally remove fish crows under 50 CFR 21.43 since 1972 (37 FR 9223), reporting was not required until 2011 (75 FR 75153-75156) and reporting is expected to be low. Therefore, 8 fish crows removed annually is likely a low estimate. If average annual lethal removal by *other* entities under 50 CFR 21.43 is estimated to be

equal to that of the highest annual lethal removal reported (53 birds) by *all* entities, and is reflective of future lethal removal, and if average annual hunter harvest remains the same, annual cumulative removal by all entities under the proposed action alternative could be estimated at 2,674 birds (53 birds by other entities, 300 birds by WS, 2,321 birds by hunters). This is equivalent to 19.1% of the Virginia population or 0.6% of the population of the U.S. and Canada. WS' lethal removal would be a limited component of the overall lethal removal occurring and should not have any significant direct or cumulative impact on fish crow populations. Most requests received by WS to address fish crows are received from airports. Airports are restricted areas where hunting is not permitted. Therefore, WS' lethal removal of fish crows is likely to occur in locations where it will not limit the ability to harvest crows. WS' lethal removal would be a limited component of the overall harvest and could be considered of low magnitude when compared to the number of crows being harvested. Lethal removal can only occur at the discretion of the USFWS and harvest can only occur within regulations established by USFWS in cooperation with VDWR. These entities ensure activities occur to achieve desired population objectives. WS would report the number of fish crows lethally removed annually to the USFWS and the VDWR.

Additionally, impacts due to the destruction of active nests should have little adverse impact on the fish crow population. Many bird species can identify areas with regular human disturbance and low reproductive success, relocating and nesting elsewhere when confronted with repeated nest failure. Although there may be reduced fecundity for the individuals affected by nest and egg destruction, this activity has no long-term effect on breeding adult birds. This method is used by WS to inhibit nesting in an area experiencing damage due to nesting activity and is employed only at the localized level. The destruction of up to 50 active fish crow nests annually by WS would occur in localized areas where nesting takes place and would not reach a level where adverse effects on fish crow populations would occur. As with the lethal removal of birds, the removal of active nests must be authorized by the USFWS. Therefore, the number of active nests removed by WS annually would occur at the discretion of the USFWS.

Common Raven Population Impact Analysis

Common ravens can be observed across the Western U.S., the upper mid-west, portions of New England and New York and in areas surrounding the Appalachian Mountains in a broad range of habitats (Billerman et al. 2020). Birds forage and roost in groups of 50 to 100 birds although roosts of more than 2,000 have been observed (Billerman et al. 2020). Peak counts of more than 100 of these birds in the western portion of the Commonwealth are not unusual (Rottenborn and Brinkley 2007).

According to BBS trend data, common raven populations in Virginia have increased 0.56% annually from 1966-2015, and 2.23% annually from 2005-2015 (Sauer et al. 2017). The number of common ravens observed in the Commonwealth during the CBC has shown an increasing trend since 1966 (National Audubon Society 2010). The Partners in Flight Science Committee (2019) estimates that the population of common ravens in the Commonwealth during the breeding season is 3,200 birds and that the population in the U.S. and Canada is 8.3 million birds.

The number of common ravens lethally removed by WS or other entities to alleviate damage and threats in Virginia from 2011 to 2017 is shown in Table 3.40. No active common raven nests were destroyed during this time. WS dispersed an average of 238 common ravens on an annual basis from 2011 to 2017 to alleviate damage and threats.

Table 3.40 – Number of common ravens addressed in Virginia from 2011 to 2017

Year	Removal Under Depredation Permits		
	Authorized Lethal Removal[ab]	WS' Lethal Removal[cd]	Total Lethal Removal by All Entities[aef]
2011	30	4	0
2012	30	14	17
2013	30	11	0
2014	30	1	0
2015	41	10	1
2016	40	25	4
2017	50	11	11
AVERAGE	**36**	**11**	**5**

[a]Data reported by calendar year, obtained from USFWS's Service Permit Issuance and Tracking System (SPITS) system, A. McCollum, USFWS, personal communication, 2018
[b]Includes birds authorized to be killed subsequent to capture if relocation is not possible
[c]Data reported by federal fiscal year, obtained from WS' Management Information System (MIS) system
[d]WS' removal conducted under depredation permits issued to WS and other entities where WS is a subpermittee
[e]Includes WS' lethal removal as reported by USFWS's SPITS system
[f]Includes birds that were reported as being captured and relocated or killed (if relocation was not possible) by USFWS's SPITS system

Direct, Indirect, and Cumulative Effects:
Based on previous requests for assistance and in anticipation of an increase in the number of requests for assistance, WS could lethally remove up to 100 common ravens and remove or destroy up to 20 active common raven nests annually under the proposed action / no action alternative to manage damage or threats of damage.

Based on the best available information, the lethal removal of up to 100 common ravens annually by WS would represent 3.12% of the Virginia population (3,200 birds) or 0.002% of the population of the U.S. and Canada (3.8 million). From 2011 to 2017, an average of 5 common ravens were lethally removed by all entities in the Commonwealth on an annual basis. If this lethal removal is reflective of future lethal removal by *other* entities, the annual cumulative lethal removal by *all* entities could be 105 birds (5 birds by other entities, 100 birds by WS). This is equivalent to 3.3% of the Virginia population or 0.003% of the population of the U.S. and Canada. Given the limited magnitude of lethal removal proposed by WS when compared to the estimated population, WS' proposed lethal removal should not have any significant direct or cumulative impact on common raven populations. Lethal removal of common ravens can only occur at the discretion of the USFWS. The USFWS ensures lethal removal occurs to achieve desired objectives. WS would report the number of common ravens lethally removed annually to the USFWS.

Additionally, impacts due to the destruction of active nests should have little adverse impact on the common raven population. Many bird species can identify areas with regular human disturbance and low reproductive success, relocating and nesting elsewhere when confronted with repeated nest failure. Although there may be reduced fecundity for the individuals affected by nest and egg destruction, this activity has no long-term effect on breeding adult birds. This method is used by WS to inhibit nesting in an area experiencing damage due to nesting activity and is employed only at the localized level. The destruction of up to 20 active common raven nests annually by WS would occur in localized areas where nesting takes place and would not reach a level where adverse effects on common raven populations would occur. As with the lethal removal of birds, the removal of active nests must be authorized by the USFWS. Therefore, the number of active nests removed by WS annually would occur at the discretion of the USFWS.

Horned Lark Population Impact Analysis

Horned larks can be found across much of the U.S., including Virginia, year-round in open habitat (Billerman et al. 2020). In most locations, birds nest and raise two broods per year (Billerman et al. 2020). A social species, horned larks form flocks of up to several hundred birds (Billerman et al. 2020). Because these birds raise two broods per year, young from the first brood form flocks beginning in late spring and these birds are then joined by young from the second brood and the breeding birds which stay together until spring (Billerman et al. 2020). Winter peak counts of >1,000 are not uncommon in the Commonwealth (Rottenborn and Brinkley 2007).

According to BBS trend data, horned lark populations in Virginia have declined 0.71% annually from 1966-2015 and increased 0.68% annually from 2005-2015 (Sauer et al. 2017). The number of horned larks observed in the Commonwealth during the CBC has shown a decreasing trend since 1966 (National Audubon Society 2010). The Partners in Flight Science Committee (2019) estimates that the population of horned larks in the Commonwealth during the breeding season is 16,000 birds and that the population in the U.S. and Canada is 100 million birds.

The number of horned larks lethally removed by WS or other entities to alleviate damage and threats in Virginia from 2011 to 2017 is shown in Table 3.41. No active horned lark nests were destroyed during this time period. WS dispersed an average of 169 horned larks on an annual basis from 2011 to 2017 to alleviate damage and threats.

Table 3.41 – Number of horned larks addressed in Virginia from 2011 to 2017

	Removal Under Depredation Permits		
Year	Authorized Lethal Removal[a]	WS' Lethal Removal[bc]	Total Lethal Removal by All Entities[ad]
2011	190	24	25
2012	266	29	105
2013	215	45	0
2014	215	29	0
2015	225	7	0
2016	225	9	7
2017	125	17	16
AVERAGE	**209**	**23**	**22**

[a]Data reported by calendar year, obtained from USFWS's Service Permit Issuance and Tracking System (SPITS) system, A. McCollum, USFWS, personal communication, 2018
[b]Data reported by federal fiscal year, obtained from WS' Management Information System (MIS) system
[c]WS' removal conducted under depredation permits issued to WS and other entities where WS is a subpermittee
[d]Includes WS' lethal removal as reported by USFWS's SPITS system

Direct, Indirect, and Cumulative Effects:
Based on previous requests for assistance and in anticipation of an increase in the number of requests for assistance, WS could lethally remove up to 250 horned larks and remove or destroy up to 20 active horned lark nests annually under the proposed action / no action alternative to manage damage or threats of damage.

Based on the best available information, the lethal removal of up to 250 horned larks annually by WS would represent 1.6% of the Virginia population (16,000 birds) or 0.0003% of the population of the U.S. and Canada (100 million birds). From 2011 to 2017, an average of 22 horned larks were lethally removed by all entities in the Commonwealth on an annual basis. If this lethal removal is reflective of future lethal

removal by other entities, the annual cumulative lethal removal by all entities under the proposed action alternative could be estimated at 272 birds (22 birds by other entities, 250 by WS). This is equivalent to 1.7% of the Virginia population or 0.0003% of the population of the U.S. and Canada. Given the limited magnitude of lethal removal proposed by WS when compared to the estimated population, WS' proposed lethal removal should not have any significant direct or cumulative impact on horned lark populations. Lethal removal of horned larks can only occur at the discretion of the USFWS. The USFWS ensures lethal removal occurs to achieve desired objectives. WS would report the number of horned larks lethally removed annually to the USFWS.

Additionally, impacts due to the destruction of active nests should have little adverse impact on the horned lark population. Many bird species can identify areas with regular human disturbance and low reproductive success, relocating and nesting elsewhere when confronted with repeated nest failure. Although there may be reduced fecundity for the individuals affected by nest and egg destruction, this activity has no long-term effect on breeding adult birds. This method is used by WS to inhibit nesting in an area experiencing damage due to nesting activity and is employed only at the localized level. The destruction of up to 20 active horned lark nests annually by WS would occur in localized areas where nesting takes place and would not reach a level where adverse effects on horned lark populations would occur. As with the lethal removal of birds, the removal of active nests must be authorized by the USFWS. Therefore, the number of active nests removed by WS annually would occur at the discretion of the USFWS.

European Starling Population Impact Analysis

As their names suggests, European starlings are not native to North America (Billerman et al. 2020). Introduced into the U.S. in the late 1800's and first observed in the Commonwealth in 1912, today these birds can be observed across the State and the U.S. year-round (Trollinger and Reay 2001, Rottenborn and Brinkley 2007, Billerman et al. 2020). European starlings utilize a variety of habitats but are most often associated with human altered landscapes (Billerman et al. 2020). These birds raise two broods per year (Billerman et al. 2020). These birds are highly social, feeding roosting and migrating in flocks year-round (Billerman et al. 2020). During the winter, European starlings may join mixed-species flocks of blackbirds (Red-winged blackbirds, common grackles, European starlings) which may number more than one million birds (Lowther 1993, Peer and Boolinger 1997). Peak counts of these birds in the Commonwealth exceed 3 million individuals (Rottenborn and Brinkley 2007).

According to BBS trend data, European starling populations in Virginia decreased 1.48% annually from 1966-2015, and 1.06% annually from 2005-2015 (Sauer et al. 2017). The number of European starlings observed in the Commonwealth during the CBC has shown a decreasing trend since 1966 (National Audubon Society 2010). The Partners in Flight Science Committee (2019) estimates that the population of European starlings in the Commonwealth during the breeding season is 1.8 million birds and that the population in the U.S. and Canada is 93 million birds.

The number of European starlings and active European starling nests lethally removed by WS to alleviate damage and threats in Virginia from 2011 to 2017 is shown in Table 3.42. European starlings are a non-native species not protected by state or federal law. Therefore, the total number of European starlings or active European starling nests lethally removed by entities other than WS during this time is unknown. WS dispersed an average of 312,110 European starlings on an annual basis from 2011 to 2017 to alleviate damage and threats.

Table 3.42 – Number of European starlings addressed by WS in Virginia from 2011 to 2017

Year	Birds	Active Nests
	WS' Lethal Removal[a]	WS' Lethal Removal[a]
2011	8,905	12
2012	3,213	10
2013	8,033	7
2014	7,063	1
2015	30,064	6
2016	8,591	1
2017	18,427	2
AVERAGE	**12,042**	6

[a]Data reported by federal fiscal year, obtained from WS' Management Information System (MIS) system, includes nontarget lethal removal

Direct, Indirect, and Cumulative Effects:
Based on previous requests for assistance and in anticipation of an increase in the number of requests for assistance, WS could lethally remove up to 50,000 European starlings and remove and destroy up to 500 European starling nests annually under the proposed action / no action alternative to manage damage or threats of damage.

WS' proposed lethal removal of up to 50,000 European starlings annually would represent 2.8% of the Virginia population (1.8 million birds) or 0.05% of the population of the U.S. and Canada (93 million birds). European starlings are a non-native species and therefore not protected by the state or federal government. Executive Order 13112 directs Federal agencies to use their programs and authorities to detect and respond rapidly to control (or eradicate) populations of invasive species. While elimination of these birds would be beneficial to the environment, WS' lethal removal under the proposed action alternative would not pose any significant direct or cumulative impacts to their populations.

Additionally, impacts due to the destruction of active nests should have little adverse impact on the European starling population. This method is used by WS to inhibit nesting in an area experiencing damage due to nesting activity and is employed only at the localized level. The destruction of up to 500 European starling nests annually by WS would occur in localized areas where nesting takes place and would not reach a level where adverse effects on starling populations would occur.

Brown-headed Cowbird Population Impact Analysis

Brown-headed cowbirds can be observed across the U.S. in open or fragmented habitat (Billerman et al. 2020). Unique in their breeding habits, brown-headed cowbirds are known as brood parasites, meaning they lay their eggs in the nests of other bird species (Billerman et al. 2020). Female brown-headed cowbird can lay up to 40 eggs per season with eggs reportedly being laid in the nests of over 220 species of birds (Billerman et al. 2020). Parental care is provided by the species whose nest the eggs are laid in (Billerman et al. 2020). Brown-headed cowbirds are highly social birds and a common component of mixed-species flocks of blackbirds (Red-winged blackbirds, common grackles, European starlings) which may number more than one million birds (Peer and Boolinger 1997, Billerman et al. 2020). Peak counts of these birds in the Commonwealth exceed 350,000 individuals (Rottenborn and Brinkley 2007).

According to BBS trend data, brown-headed cowbird populations in Virginia increased 0.61% annually from 1966-2015 and decreased 0.29% annually from 2005-2015 (Sauer et al. 2017). The number of brown-headed cowbirds observed in the Commonwealth during the CBC has shown a decreasing trend since 1966 (National Audubon Society 2010). The Partners in Flight Science Committee (2019)

estimates that the population of brown-headed cowbirds in the Commonwealth during the breeding season is 500,000 birds and that the population in the U.S. and Canada is 130 million birds.

The number of brown-headed cowbirds lethally removed by WS or other entities to alleviate damage and threats in Virginia from 2011 to 2017 is shown in Table 3.43. Brown-headed cowbirds can be lethally removed under depredation permits issued by USFWS or under the 50 CFR 21.43 of the MBTA. WS dispersed an average of 7,863 brown-headed cowbirds on an annual basis from 2011 to 2017 to alleviate damage and threats.

Table 3.43 – Number of brown-headed cowbirds addressed in Virginia from 2011 to 2017

	Removal Under Depredation Permits and 50 CFR 21.43 (Blackbird Depredation Order)	
Year	**WS' Lethal Removal[a]**	**Total Lethal Removal by All Entities[bc]**
2011	906	0
2012	620	0
2013	872	699
2014	698	0
2015	646	0
2016	1,140	162
2017	165	84
AVERAGE	**721**	**135**

[a]Data reported by federal fiscal year, obtained from WS' Management Information System (MIS) system, includes nontarget lethal removal
[b]Data reported by calendar year, obtained from USFWS's Service Permit Issuance and Tracking System (SPITS) system, A. McCollum, USFWS, personal communication, 2018
[c]Includes WS' lethal removal as reported by USFWS's SPITS system

Direct, Indirect, and Cumulative Effects:
Based on previous requests for assistance and in anticipation of an increase in the number of requests for assistance, WS could lethally remove up to 5,000 brown-headed cowbirds annually under the proposed action / no action alternative to manage damage or threats of damage.

The lethal removal of up to 5,000 brown-headed cowbirds annually by WS would represent 1.0% of the Virginia population (500,000 birds) or 0.004% of the population of the U.S. and Canada (130 million). From 2011 to 2017, an average of 135 brown-headed cowbirds were lethally removed by all entities in the Commonwealth under depredation permits and 50 CFR 21.43 on an annual basis. Although it has been legal to lethally remove brown-headed cowbirds under 50 CFR 21.43 since 1958 (23 FR 5481-5482), reporting was not required until 2011 (75 FR 75153-75156) and reporting is expected to be low. Therefore, 135 birds removed annually is likely a low estimate. If average annual lethal removal by other entities under 50 CFR 21.43 is estimated to be equal to that of the highest annual lethal removal reported (699 birds) by all entities, and is reflective of future lethal removal, annual cumulative lethal removal by all entities under the proposed action alternative could be estimated at 5,699 birds (699 birds by other entities, 5,000 birds by WS). This is equivalent to 1.1% of the Virginia population or 0.004% of the population of the U.S. and Canada. Given the limited magnitude of lethal removal proposed by WS when compared to the estimated population, WS' proposed lethal removal should not have any significant direct or cumulative impact on brown-headed cowbird populations. Lethal removal of brown-headed cowbirds can only occur at the discretion of the USFWS. The USFWS ensures lethal removal occurs to achieve desired objectives. WS would report the number of brown-headed cowbirds lethally removed annually to the USFWS.

Rusty Blackbird Population Impact Analysis

Rusty blackbirds can be observed across eastern portions the U.S. during the nonbreeding season and in portions of New England and New York during the breeding season (Billerman et al. 2020). Preferred habitat consists of open areas, wetlands, swamps and wet woodlands (Billerman et al. 2020). Birds nest once per year (Billerman et al. 2020). Highly social birds, rusty blackbirds forage, roost and loaf with other rusty blackbirds (single-species flocks) and alongside other blackbirds (red-winged blackbird, brown-headed cowbirds, grackles) (Billerman et al. 2020). Mixed species flocks can number up to 20 million individuals (Billerman et al. 2020). Peak counts of these birds in the commonwealth exceed 17,000 birds (Rottenborn and Brinkley 2007).

According to BBS trend data, rusty blackbird populations in the Eastern U.S. BBS survey region have declined 3.33% annually from 1966-2015, and 1.79% annually from 2005-2015 (Sauer et al. 2017). The number of rusty blackbirds observed in the Commonwealth during the CBC has shown a decreasing trend since 1966 (National Audubon Society 2010). The Partners in Flight Science Committee (2019) estimates the population of rusty blackbirds in the U.S. and Canada at 6.8 million birds. These birds are included on USFWS's regional list of bird species of concern (Appendix D).

Rusty blackbirds were removed from the Blackbird Depredation Order (50 CFR 21.49) on January 3, 2011 (75 FR 75153-75156). Rationale for removing rusty blackbirds was "a long-term downward trend in its population and its special conservation status" (i.e., listed as a species of concern by various entities) (73 FR 74447-74451, 75 FR 75153-75156).

Although lethal removal was authorized, no rusty blackbirds were lethally removed by WS or other entities to alleviate damage and threats in Virginia from 2011 to 2017. No active rusty blackbird nests were destroyed during this time. WS did not disperse any rusty blackbirds on an annual basis to alleviate damage and threats during this time.

Direct, Indirect, and Cumulative Effects:
In anticipation requests for assistance, WS could lethally remove up to 20 rusty blackbirds annually under the proposed action / no action alternative to manage damage or threats of damage.

Based on the best available information, the lethal removal of up to 20 rusty blackbirds annually by WS would represent 0.0003% of the population in the U.S. and Canada (6.8 million birds). From 2011 to 2017, no rusty blackbirds were lethally removed in the Commonwealth. If this lethal removal is reflective of future lethal removal by *other* entities, the annual cumulative lethal removal by *all* entities could be 20 birds. Given the limited magnitude of lethal removal proposed by WS when compared to the estimated population, WS' proposed lethal removal should not have any significant direct or cumulative impact on rusty blackbird populations. Lethal removal of rusty blackbirds can only occur at the discretion of the USFWS. The USFWS ensures lethal removal occurs to achieve desired objectives. WS would report the number of rusty blackbirds lethally removed annually to the USFWS.

Boat-tailed Grackle Population Impact Analysis

Boat-tailed grackles can be observed along the Atlantic and Gulf Coasts in open habitat, freshwater, brackish and saltwater wetlands (Billerman et al. 2020). During the non-breeding season, birds from areas to the north travel south to winter in coastal Virginia and points farther south (Billerman et al. 2020). Birds in more southern regions remain year-round (Billerman et al. 2020). Birds may nest up to twice a year (Billerman et al. 2020). Highly social birds, boat-tailed grackles nest colonially and roost,

loaf, feed and travel in flocks along with common grackles and red-winged blackbirds (Billerman et al. 2020). Peak counts in the Commonwealth exceed 7,000 birds (Rottenborn and Brinkley 2007).

According to BBS trend data, boat-tailed grackle populations in the Eastern BBS region are declining; 1.03% annually from 1966-2015, and 1.21% annually from 2005-2015 (Sauer et al. 2017). Although there is no BBS data available for Virginia, there is data from adjacent states. While Maryland shows a declining trend from 2005 to 2015 (1.58%), other states show an increasing trend; North Carolina (3.57%), Delaware (2.84%). In contrast, trends from the greater region (Southeastern Coastal Plain, New England/Mid-Atlantic coast) show increasing trends (2.22% and 4.48%, respectively).
The number of boat-tailed grackles observed in the Commonwealth during the CBC has shown a decreasing trend since 1966 (National Audubon Society 2010). The Partners in Flight Science Committee (2019) estimates that the population of boat-tailed grackles in the Commonwealth during the breeding season is 11,000 birds and that the population in the U.S. and Canada is 2.2 million birds.

The number of boat-tailed grackles lethally removed by WS or other entities to alleviate damage and threats in Virginia from 2011 to 2017 is shown in Table 3.44. Boat-tailed grackles can be lethally removed under depredation permits issued by USFWS or under the 50 CFR 21.43 of the MBTA.
WS dispersed an average of 136 boat-tailed grackles on an annual basis from 2011 to 2017 to alleviate damage and threats.

Table 3.44 – Number of boat-tailed grackles addressed in Virginia from 2011 to 2017

	Removal Under Depredation Permits and 50 CFR 21.43 (Blackbird Depredation Order)	
Year	**WS' Lethal Removal[a]**	**Total Lethal Removal by All Entities[bc]**
2011	0	0
2012	7	7
2013	0	0
2014	0	0
2015	3	3
2016	19	20
2017	0	0
AVERAGE	**4**	**4**

[a]Data reported by federal fiscal year, obtained from WS' Management Information System (MIS) system, includes nontarget lethal removal
[b]Data reported by calendar year, obtained from USFWS's Service Permit Issuance and Tracking System (SPITS) system, A. McCollum, USFWS, personal communication, 2018
[c]Includes WS' lethal removal as reported by USFWS's SPITS system

Direct, Indirect, and Cumulative Effects:
Based on previous requests for assistance and in anticipation of an increase in the number of requests for assistance, WS could lethally remove up to 400 boat-tailed grackles annually under the proposed action / no action alternative to manage damage or threats of damage.

The lethal removal of up to 400 boat-tailed grackles annually by WS would represent 3.6% of the Virginia population (11,000 birds) or 0.02% of the population of the U.S. and Canada (2.2 million). From 2011 to 2017, an average of 4 boat-tailed grackles were lethally removed by all entities in the Commonwealth under depredation permits and 50 CFR 21.43 on an annual basis. Although it has been legal to lethally remove boat-tailed grackles under 50 CFR 21.43 since 1958 (23 FR 5481-5482), reporting was not required until 2011 (75 FR 75153-75156) and reporting is expected to be low. Therefore, 4 birds removed annually is likely a low estimate. If average annual lethal removal by other

entities under 50 CFR 21.43 is estimated to be equal to that of the highest annual lethal removal reported (20 birds) by all entities, and is reflective of future lethal removal, annual cumulative lethal removal by all entities under the proposed action alternative could be estimated at 420 birds (20 birds by other entities, 400 birds by WS). This is equivalent to 3.8% of the Virginia population or 0.02% of the population of the U.S. and Canada. Given the limited magnitude of lethal removal proposed by WS when compared to the estimated population, WS' proposed lethal removal should not have any significant direct or cumulative impact on boat-tailed grackle populations. Lethal removal of boat-tailed grackles can only occur at the discretion of the USFWS. The USFWS ensures lethal removal occurs to achieve desired objectives. WS would report the number of boat-tailed grackles lethally removed annually to the USFWS.

Free Ranging Domestic and Feral Chickens, Free Ranging Domestic and Feral Guinea Fowl, Free Ranging Domestic and Feral Peafowl Population Impact Analysis

Domestic refers to birds which have through selective breeding to become notably different than their wild ancestors. Chickens, thought to be domesticated in prehistoric times, are decedent from red jungle fowl, wild birds native to Southeastern Asia (Lever 2005). Crossbreeding has resulted in the development of numerous domestic varieties that no longer exhibit the external characteristics of their wild ancestors. Guinea fowl, native to sub-Saharan Africa, were domesticated at least as early as the time of ancient Greeks and Romans (Lever 2005). Finally, peafowl, natives of Pakistan, India, and Nepal have been domesticated since ancient times (Nair 1972, Lever 2005). All three can be found worldwide in captivity as well as in free ranging and feral populations (Lever 2005).

When domesticated birds escape or are abandoned, dumped or released they can become feral and form self-sustaining populations. These birds can be observed in locations such as business parks, universities, parks, wildlife management areas, military bases, and residential communities. Currently, there are no population estimates for free ranging domestic and feral chickens, guinea fowl or peafowl in the Commonwealth.

No free ranging domestic and feral chickens, guinea fowl, or peafowl or their active nests were lethally removed or dispersed by WS to alleviate damage and threats in Virginia from 2011 to 2017. These birds are non-native species not protected by state or federal law. Therefore, the total number of free ranging domestic and feral chickens, guinea fowl or peafowl lethally removed by entities other than WS during this time is unknown.

Direct, Indirect, and Cumulative Effects:
Based on previous requests for assistance and in anticipation of an increase in the number of requests for assistance, WS could lethally remove up to 250 free ranging domestic and feral chickens, 250 free ranging domestic and feral guinea fowl, and 100 free ranging domestic and feral peafowl and remove or destroy up to 50 active free ranging domestic and feral chicken nests, 50 active free ranging domestic and feral guinea fowl nests and up to 25 active free ranging domestic and feral peafowl nests annually under the proposed action / no action alternative to manage damage or threats of damage. Free ranging domestic and feral chicken, guinea fowl and peafowl are non-native species not protected under state or federal law. Executive Order 13112 directs Federal agencies to use their programs and authorities to, detect and respond rapidly to control (or eradicate) populations of invasive species. While elimination of these birds would be beneficial to the environment, WS' lethal removal under the proposed action alternative would not pose any significant direct or cumulative impacts to their populations.

Additionally, impacts due to the destruction of active nests should have little adverse impact on the free ranging domestic and feral chicken, guinea fowl and peafowl population. The destruction of up to 50 active free ranging domestic and feral chicken nests, 50 active free ranging domestic and feral guinea fowl nests and up to 25 active free ranging domestic and feral peafowl nests annually by WS would occur

in localized areas where nesting takes place and would not reach a level where direct or cumulative impacts on populations would occur.

Wildlife Disease Surveillance and Monitoring

Under the proposed action / no action alterative, WS could sample birds for disease. These birds could have been captured live by WS or other entities, been found dead or been harvested by hunters. The sampling (e.g., drawing blood, swabbing nasal cavities, collecting fecal samples) and the subsequent release of live-captured birds would not result in adverse effects to bird populations since those individuals would be released unharmed on site. Additionally, the sampling of birds that were sick, dying, found dead or harvested by hunters would not result in the additive lethal removal of birds that would not have already occurred in the absence of WS' activities. Therefore, the sampling of birds for disease as described above would not adversely affect the populations or the ability to harvest any of the bird species addressed in this EA.

Alternative 2 – WS Would Address Bird Damage by Providing Technical Assistance and Nonlethal Direct Operational Assistance

Under this alternative, WS could continue to provide those persons requesting assistance with managing damage and threats associated with birds with technical assistance as described in Alternative 1. Additionally, WS could provide direct operational assistance, but would only utilize nonlethal techniques. WS would not provide direct operational assistance utilizing lethal techniques. Despite this, those persons experiencing damage could continue to alleviate damage by employing both nonlethal and lethal methods. Not all methods would be available under this alternative. DRC-1339 formulations are only registered for use by WS and therefore would be unavailable under this alternative.

This alternative would place the immediate burden of lethal direct operational damage management work on the resource owner, other governmental agencies, private businesses and/or private individuals. Those persons experiencing damage or threats could act using those methods legally available to resolve or prevent damage as permitted by federal, Commonwealth, and local laws and regulations or those persons could take no action. The provision of technical assistance and nonlethal direct operational assistance by WS is unlikely to increase the number of animals addressed or limit the ability to harvest birds because those individuals experiencing damage likely would employ both lethal and nonlethal methods in the absence of WS' assistance.

Direct, Indirect, and Cumulative Effects:
The number of birds lethally removed under this alternative would likely be similar to the other alternatives. The lethal removal of birds addressed in this EA may occur under migratory bird depredation permits issued by the USFWS, under 50 CFR 21.43 (blackbird depredation order), during regulated harvest seasons, or under §29.1-529 of the Code of Virginia. Lethal removal of non-native birds addressed in this EA may occur without a permit or authorization.

With the oversight of the USFWS and the VDWR, it is unlikely that bird populations would be significantly impacted, directly or cumulatively, by the implementation of this alternative. Lethal management actions could be undertaken by a property owner or manager, provided by private nuisance wildlife control agents, provided by volunteer services of private individuals or organizations, or provided by other entities such as the USFWS and the VDWR. If lethal direct operational assistance is not provided by WS or other entities, it is hypothetically possible that frustration caused by the inability to reduce damage and threats could lead to the inappropriate use of lethal methods or the use of illegal methods which could lead to unnecessary killing of wildlife. In the past, people have resorted to the

illegal use of chemicals and methods to alleviate wildlife damage issues (White et al. 1989, USFWS 2001, FDA 2003).

Alternative 3 – WS Would Not Address Bird Damage

Under this alternative, WS would not conduct technical or direct operational assistance to reduce threats or alleviate damage associated with birds. WS would not be involved with any aspect of managing damage associated with birds and therefore would have no direct impact on bird populations or the ability to harvest birds. All requests for assistance received by WS to resolve damage caused by birds would be referred to the USFWS, the VDWR, the VDACS, local law enforcement or animal control authorities and/or private entities.

Despite no involvement by WS in resolving damage and threats associated with birds, those persons experiencing damage could continue to alleviate damage by employing both nonlethal and lethal methods. Not all methods would be available under this alternative. DRC-1339 formulations and Mesurol are only registered for use by WS and therefore would be unavailable under this alternative.

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

Direct, Indirect, and Cumulative Effects:
The lethal removal of birds addressed in this EA may occur under migratory bird depredation permits issued by the USFWS, during regulated harvest seasons, under 50 CFR 21.43 (blackbird depredation order), or under §29.1-529 of the Code of Virginia. Lethal removal of non-native birds addressed in this EA may occur without a permit or authorization. The number of birds lethally removed under this alternative and any direct or cumulative population impacts would likely be similar to the other alternatives. It is not expected that lethal removal would reach a level where it would have a significant direct or cumulative impact to target bird populations.

Management actions could be undertaken by a property owner or manager, provided by private nuisance wildlife control agents, provided by volunteer services of private individuals or organizations, or provided by other entities such as the USFWS and the VDWR. If direct operational assistance and technical assistance is not provided by WS or other entities, it is possible that a lack of technical knowledge could lead to misidentification and targeting of bird(s) responsible for damage. It is also possible that frustration caused by the inability to reduce damage and threats along with ignorance on how best to reduce damage and threats could lead to the inappropriate use of legal methods and the use of illegal methods. This may occur if those persons or organizations providing technical assistance have less technical knowledge and experience managing wildlife damage than WS. Illegal, unsafe, and environmentally unfriendly actions could lead to unnecessary killing of wildlife. In the past, people have resorted to the illegal use of chemicals and methods to alleviate wildlife damage issues (White et al. 1989, USFWS 2001, FDA 2003).

Issue 2 - Effects of Damage Management Activities on Nontarget Animals, Including Threatened and Endangered Species

As discussed previously, a concern is often raised about the potential impacts to nontarget animal populations, including threatened and endangered species, from the use of methods to resolve damage associated with birds. The potential effects are analyzed below.

Alternative 1 – WS Would Continue to Address Bird Damage through an Adaptive Integrated Approach (Proposed Action / No Action Alternative)

The potential adverse effects to nontargets occur from the employment of methods to address damage associated with birds. All methods listed in Appendix E would be available under this alternative. Under the proposed action / no action alternative, WS could provide both technical assistance and direct operational assistance to those persons requesting assistance.

Standard Operating Procedures (SOPs) discussed in Chapter 2 ensure risks to nontarget animals, including threatened and endangered species, would be reduced or prevented under the proposed action / no action alternative.

Nonlethal Methods

Nonlethal methods have the potential to cause adverse effects to nontargets primarily though physical exclusion, frightening devices, deterrents or repellants (see Appendix E). All the nonlethal methods listed in Appendix E could be available under this alternative although not all methods would be available for direct implementation by all persons (DRC-1339 formulations and Mesurol are only available for use by WS). Any exclusionary device erected to prevent access to resources could also potentially exclude nontarget species; therefore, adversely impacting that species. The use of frightening devices, deterrents or repellants may also disperse nontarget species from the immediate area where they are employed. However, the potential impacts to nontargets, like the impacts to target species, are expected to be temporary. WS would not employ or recommend these methods be employed over large geographic areas or at such intensity that essential resources would be unavailable and that long-term adverse impacts to nontarget populations would occur. When employing inactive nest destruction, WS would identify the species of birds responsible for building the nest prior to destruction which would eliminate impacts to nontargets.

Other nonlethal methods available for use under any of the alternatives are live-capture devices (see Appendix E). When deploying live-capture devices, WS would use and recommend the use of target-specific attractants and place them or recommend they be placed in areas where target species are active to reduce the risk of capturing nontargets. WS would monitor or recommend devices be monitored frequently so nontarget species can be released unharmed.

Both bald eagles and golden eagles may occur in or near areas where damage management activities are conducted. Routine activities conducted by WS' personnel under the proposed action / no action alternative could occur in areas where eagles are present, which could disrupt the current behavior of an eagle or eagles that are nearby during those activities. "*Take*" as defined by the Bald and Golden Eagle Protection Act, includes those actions that "*disturb*" eagles. Disturb has been defined under 50 CFR 22.3 as those actions that cause or are likely to cause injury to an eagle, a decrease in productivity, or nest abandonment by substantially interfering with their normal breeding, feeding, or sheltering behavior. WS has reviewed the nonlethal methods available under the proposed action / no action alternative and the use patterns of those methods. The routine activities that WS conducts would not meet the definition of disturb requiring a permit for the take of eagles. The USFWS states, "*Eagles are unlikely to be disturbed by routine use of roads, homes, or other facilities where such use was present before an eagle pair nesting in a given area. For instance, if eagles build a nest near your existing home, cabin, or place of business you do not need a permit.*" (USFWS 2016c). Therefore, activities that are species specific and are not of a duration and intensity that would result in disturbance as defined by the Act would not result in non-purposeful take (e.g., unintentional disturbance of an eagle). Activities, such as walking to a site, discharging a firearm, riding an ATV or driving a boat, generally represent short-term disturbances to

sites where those activities take place. WS would conduct activities that are located near eagle nests using the National Bald Eagle Management Guidelines (USFWS 2007). The categories that encompass most of these activities are Category D (off-road vehicle use), Category F (non-motorized recreation and human entry), and Category H (blasting and other loud, intermittent noises). These categories generally call for a buffer of 330 to 660 feet for category D and F, and a ½-mile buffer for category H. WS would take active measures to avoid disturbance of bald eagle nests by following the National Bald Eagle Management Guidelines. However, other routine activities conducted by WS do not meet the definition of "*disturb*" as defined under 50 CFR 22.3. Those methods and activities would not cause injuries to eagles and would not substantially interfere with the normal breeding, feeding, or sheltering behavior of eagles.

Eagles may occur in or near areas where live-capture devices are set to capture vultures or raptors. The walk-in, live traps used to capture vultures are baited with animal carcasses and therefore may attract scavenging eagles. Similarly, cage traps (e.g., Swedish goshawk trap) which utilize live animals (e.g., rock doves) as an attractant and set with the intention of capturing other raptors (e.g., hawks) may also attract eagles. WS follows WS Directives and SOPs to avoid capturing nontargets including eagles. In Virginia, from 2011 to 2017, even with precautions in place, there was one occurrence of a bald eagle walking into a vulture trap and three occurrences of bald eagles being captured in raptor traps during activities outlined in the need for action. These birds were released unharmed either by directing them towards the entrance or by opening the trap and allowing the birds to fly out. These live-capture devices pose minimal risk to eagles because there is a high probability that eagles captured would be released unharmed when WS Directives and SOPs are followed. WS would document and report all incidences of eagle capture to USFWS. In cases where it is believed that there is a high likelihood of eagles being captured WS would consult with USFWS regarding the need for a permit under 50 CFR 22.

Of additional concern are the risks to nontarget animals, including threatened and endangered species from nonlethal chemical methods (e.g. anthraquinone, Mesurol, methyl anthranilate etc.) (for complete list see Appendix E). WS personnel who possess or use these methods would be trained and certified in accordance with WS Directive 2.401 and SOPs. All methods listed in the Appendix could be available under this alternative. Mesurol is a repellent used to deter crows and ravens predating the eggs of threatened or endangered species (see Appendix E). Application involves injecting Mesurol into eggs of domestic birds similar in appearance to the eggs of the threatened or endangered species needing protection. These eggs are then placed in artificial nests or upon elevated platforms. After eating treated eggs, birds experience discomfort and an aversion to consuming similar looking eggs (Dimmick and Nicolaus 1990). WS would not place treated eggs in locations where there is a danger that threatened or endangered species will consume them. If there is a danger, WS would take special precautions such as constant observation or the use of hazing techniques. Additional label requirements limiting the number of treated eggs per acre and detailing the removal and disposal process for unconsumed or unused treated eggs would further limit the risk to nontarget species.

Nonlethal methods are generally regarded has having minimal impacts on populations because individuals are unharmed. Therefore, nonlethal methods would not have any significant adverse impacts on nontarget populations of wildlife including threatened and endangered species under this alternative.

Lethal Methods

Eagles may occur in or near areas where lethal methods outlined under the proposed action / no action alternative are used. Non-purposeful lethal removal of a bald or golden eagle or their nests is considered a "take" as defined by the Bald and Golden Eagle Protection Act. WS has reviewed those methods and the use patterns of those methods available under the proposed action / no action alternative and determined that SOPs that WS uses while conducting damage management activities make it unlikely that

eagles could be lethally removed. Trend data from the Virginia BBS from 1966-2015, and 2005-2015 indicates that bald eagle populations have increased at an annual rate of 8.6% and 12.5% respectively (Sauer et al. 2017). The number of both bald and golden eagles observed in the Commonwealth during the Christmas Bird Count has shown an increasing trend since 1966 (National Audubon Society 2010).

All the lethal methods listed in Appendix E could be available under this alternative.

4-Aminopyridine or Avitrol®– Although Avitrol is registered as a chemical frightening agent, some birds that ingest the product die. WS would use Avitrol in accordance with the label and WS Directive 2.401 to minimize risks to nontargets. A period of mandatory pre-baiting acclimates target bird species to a feeding schedule, ensuring that bait is quickly consumed, making it unavailable to nontargets. Unconsumed or unused Avitrol and carcasses of birds killed must be removed and disposed of in accordance with the label and WS Directives 2.401 and 2.515. These measures reduce the possibility that Avitrol would pose a primary or secondary hazard to nontarget or threatened or endangered species. WS' recommendation of the use of this method is not likely to increase the risk to nontargets.

DRC-1339 AND Starlicide –WS personnel who possess or use DRC-1339 would be trained and certified in accordance with the label and WS Directive 2.401. Potential treatment sites are pre-baited and monitored for nontarget use. The bait type selected can be used to limit the likelihood that nontarget species would consume treated bait since some bait types are not preferred by nontarget species. By acclimating target bird species to a feeding schedule, baiting can occur at specific times to ensure bait placed is quickly consumed, making it unavailable to nontargets. Unconsumed or unused DRC 1339 and carcasses of birds killed must be removed and disposed of in accordance with the label and WS Directives 2.401 and 2.515. These measures reduce the possibility that DRC-1339 would pose a primary or secondary hazard to nontarget or threatened or endangered species. WS' recommendation of the use of DRC-1339 by WS or Starlicide by other entities is not likely to increase the risk to nontargets.

Egg and Active Nest Destruction – In situations where nest and egg destruction were selected as an appropriate method, WS would identify the species of birds responsible for laying the egg(s) or building the nest prior to destruction which would eliminate risks to nontargets. WS' recommendation that nest and egg destruction be used would not increase risks to nontargets.

Euthanasia – Nontarget species captured during the implementation of nonlethal capture methods can usually be released prior to euthanasia which occurs subsequent to live-capture. Therefore, no adverse effects to nontargets would occur from the use of euthanasia methods by WS under this alternative. Similarly, WS' recommendation of euthanasia methods would not increase risks to nontargets because these methods are selective for target species and the unintentional euthanasia of nontargets would not likely increase based on WS' recommendation of the method.

Shooting – In cases where shooting was selected as an appropriate method, identification of an individual target would occur prior to application, eliminating risks to nontargets. WS' recommendation that shooting be used would not increase risks to nontargets. Shooting would be selective for target species and the unintentional lethal removal of nontargets would not likely increase based on WS' recommendation of the method.

Direct, Indirect, and Cumulative Effects:
The analysis to determine the impacts on nontargets from the use of both lethal and nonlethal methods is based on a measure of the number of individuals lethally removed. Methods would only be used by WS at the request of persons seeking assistance. The number of individuals of nontarget species lethally removed during WS damage management activities outlined in the need for action in Virginia from FY

2011 to FY 2017 is shown in Table 3.45. Those species lethally removed unintentionally by WS during management activities outlined in the need for action are common throughout Virginia and not considered to be of low density. WS' unintentional lethal removal of animals that could occur as part of damage management activities outlined in the need for action is limited and is not expected to have any impact on local or statewide populations. The species of animals lethally removed unintentionally in the past by WS is representative of animals that could be unintentionally removed by WS under the proposed action / no action alternative. Additionally, other species could be lethally removed unintentionally during bird damage management activities. However, the lethal removal of those species would occur infrequently and not at levels that would cause significant adverse effects to those species' populations.

Table 3.45 – Species and number of individual animals unintentionally lethally removed by WS during WS' damage management activities outlined in the need for action compared to total number of individual animals lethally removed both unintentionally and intentionally by WS during WS' damage management activities to protect other resources and private harvest.

Species	WS' Average Annual Lethal Removal (2011 to 2017)[a]			Average Annual Private Harvest[c] (2011 to 2017)
	Lethal removal during activities outlined in the need for action	Lethal removal during activities to manage damage to other resources[b]	Total lethal removal by WS	
Carolina Chickadee	<1	0	<1	n/a
Virginia Opossum	<1	64	64	6,726
Raccoon	<1	383	383	79,446

[a]Data reported by federal fiscal year. Figures are rounded to nearest whole number. <1 is defined as any number less than one.
[b]This lethal removal is analyzed in separate analyses pursuant to the NEPA
[c]Data reported by VDGIF 2012, 2016; Kidd et al. 2014a; Kidd et al. 2014b; Carey and Klopfer 2019. Carolina chickadee (*Poecile carolinensis*) may not be legally harvested.

The capture and lethal removal that could occur as part of damage management activities to protect resources other than those outlined in the need for action are addressed in separate analyses pursuant to the NEPA. However, species captured and lethally removed both intentionally and unintentionally as part of those damage management activities are also addressed in this EA to ensure a cumulative evaluation of potential effects under the proposed action / no action alternative. Average annual unintentional lethal removal by WS during activities to manage damage outlined in the need for action did not exceed one individual of any species. Apart from the Carolina chickadee, the cumulative impacts of lethal removal on nontarget species are within the extent analyzed in separate analyses pursuant to the NEPA. That document concluded that WS would not adversely affect the viability of any wildlife species populations through program activities (USDA 2017). From FY 2011 to FY 2017, WS lethally removed two Carolina chickadees (<1 Carolina Chickadee per year). The best available data estimates that the population of Carolina chickadees in Virginia at 690,000 birds (Partners in Flight Science Committee 2019). Based on this estimate, the lethal removal of two Carolina chickadees would represent 0.0002% of the Virginia population. When compared to the overall population, the magnitude of lethal removal by WS would be considered low.

WS continually monitors, evaluates and makes modifications as necessary to methods or strategy when providing direct operational assistance, to not only reduce damage but also to minimize potentially harmful effects to nontargets. Additionally, WS would annually report lethal removal to the USFWS and VDWR, which ensures cumulative impacts are considered as part of population management objectives. As previously mentioned, nonlethal methods are generally regarded as having minimal impacts on populations because individuals are unharmed. Therefore, nonlethal methods, including the live-capture and release of nontargets would not have any adverse impacts on nontarget populations under this alternative. Unintentional lethal removal could result in declines in the number of individuals in a

population; however, the lethal removal of nontarget animals by WS under the proposed action would not reach a magnitude where adverse effects would occur to the population of any species.

Threatened and Endangered Species:
Special efforts are made to avoid jeopardizing threatened and endangered species. Threatened and endangered species listed by the USFWS or the National Marine Fisheries Service (NMFS) or by the Commonwealth can be found in Appendix G and Appendix H. These lists were obtained and reviewed during the development of this EA.

Federally Listed Species- WS requested a Section 7 consultation with the USFWS to determine what affect, if any, the proposed activities could have on threatened and endangered species or their critical habitat. WS made a "may affect, but not likely to adversely affect" determination for the following species: Indiana bat (*Myotis sodalis*), northern long-eared bat (*Myotis septentrionalis*), piping plover, red knot (*Calidris canutus rufa*), and roseate tern. The USFWS concurred that WS activities pursuant to this EA would not have an adverse effect on the previously mentioned species (Rachel Case, USFWS, personal communication, October 19, 2020).

State Listed Species- WS reviewed the species listed by the state and determined that the proposed activities would have no effect or would not likely adversely effect the species currently listed by the state.

Summary of nontarget animal impact analysis
Based on WS' determination, the employment of methods by WS would not likely adversely directly or cumulatively affect any nontargets, including threatened and endangered species. No potential indirect effects were identified. WS continually monitors, evaluates and makes modifications as necessary to methods or strategy when providing direct operational assistance, to not only reduce damage but also to minimize potentially harmful effects to nontargets. Additionally, WS consults with the USFWS and the VDWR to determine the potential risks to eagles and federally and state listed threatened and endangered species in accordance with the Bald and Golden Eagle Protection Act, ESA and Commonwealth laws. WS annually reports to these entities to ensure that any nontarget lethal removal by WS is considered as part of management objectives. Potential direct and cumulative impacts to nontargets, including threatened and endangered species, from the recommendation of methods by WS under this alternative would be expected to be insignificant.

Alternative 2 – WS Would Address Bird Damage by Providing Technical Assistance and Nonlethal Direct Operational Assistance

Under this alternative, WS could continue to provide those persons requesting assistance with managing damage and threats associated with birds with technical assistance as described in Alternative 1. Additionally, WS could provide direct operational assistance, but would only utilize nonlethal techniques. WS would not provide direct operational assistance utilizing lethal techniques. Despite this, those persons experiencing damage could continue to alleviate damage by employing both non-chemical and chemical methods. Not all methods would be available under this alternative. DRC-1339 formulations are only registered for use by WS and therefore would be unavailable under this alternative.

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

Direct, Indirect, and Cumulative Effects:
If direct lethal operational assistance is not provided by WS or other entities, it is possible that frustration caused by the inability to reduce damage and threats could lead to the inappropriate use of legal methods or the use of illegal methods which could lead to real but unknown effects on other animal populations. In the past, people have resorted to the illegal use of chemicals and methods to alleviate wildlife damage issues (White et al. 1989, USFWS 2001, FDA 2003).

Potential impacts to nontarget animals, including threatened and endangered species, from the recommendation of methods by WS under this alternative would be variable. If methods were employed as recommended by WS, potential direct or cumulative risks to nontargets would likely be low and similar to the proposed action / no action alternative. WS' involvement would not be additive to lethal removal that could occur since the individual requesting WS' assistance could conduct damage management activities without WS' involvement. However, if methods were not employed as recommended or methods that are not recommended were employed, potential direct, indirect or cumulative impacts to nontargets are likely to be higher. However, impacts would not be expected to be significant.

Alternative 3 – WS Would Not Address Bird Damage

WS would not be involved with any aspect of managing damage associated with birds. Therefore, WS would have no direct impact to nontargets or threatened and endangered species under this alternative. All requests for assistance received by WS to resolve damage associated with birds would be referred to the USFWS, the VDWR, the VDACS, local law enforcement or animal control authorities and/or private entities.

Despite no involvement by WS in resolving damage and threats associated with birds, those persons experiencing damage could continue to alleviate damage by employing both nonlethal and lethal methods. Not all methods would be available under this alternative. DRC-1339 formulations and Mesurol are only registered for use by WS and therefore would be unavailable under this alternative.

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

Direct, Indirect, and Cumulative Effects:
Potential impacts to nontarget species, including threatened and endangered species, would be variable under this alternative. If direct operational assistance and technical assistance is not provided by WS or other entities, it is possible that frustration caused by the inability to reduce damage and threats along with ignorance on how best to reduce damage and threats could lead to the inappropriate use of legal methods and the use of illegal methods. Illegal, unsafe, and environmentally unfriendly actions could lead to unnecessary killing of nontarget animals. In the past, people have resorted to the illegal use of chemicals and methods to alleviate wildlife damage issues (White et al. 1989, USFWS 2001, FDA 2003). However, if appropriate direct operational assistance and technical assistance was provided by persons knowledgeable and experienced in managing damage associated with birds, the risks would be similar to the other alternatives. However, impacts would not be expected to be significant.

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

An additional issue often raised is the potential risks to human health and safety associated with the methods employed to manage damage associated with birds. Both chemical and non-chemical methods have the potential to have adverse direct, indirect or cumulative effects on human health and safety. Risks can occur both to persons employing methods and persons encountering methods. Risks can be inherent to the method itself or related to the misuse of the method. Potential effects of damage management activities on human health and safety under each of the three alternatives are analyzed below.

Alternative 1 – WS Would Continue to Address Bird Damage through an Adaptive Integrated Approach (Proposed Action / No Action Alternative)

Under the proposed action / no action alternative, WS could provide both technical assistance and direct operational assistance to those persons requesting assistance. Standard Operating Procedures (SOPs) discussed in Chapter 2 ensure risks to human health and safety would be reduced or prevented. Pertinent SOPs include the WS Decision Model (WS Directive 2.201), an evaluation process for the appropriateness of methods (WS Directive 2.101) and the use of integrated management (WS Directive 2.105). Although hazards to human health and safety from both nonlethal and lethal methods exist, those methods would generally be regarded as safe when used by individuals trained and experienced in their use and with regard and consideration of possible risks to human health and safety.

Direct, Indirect, and Cumulative Effects:
Nonchemical methods available for use under any of the alternatives are: resource management, physical exclusion, frightening devices or deterrents, live capture devices, inactive nest destruction and mechanical egg and active nest destruction, hunting, shooting and live-capture followed by non-chemical euthanasia (see Appendix E). The risk most live-capture devices pose to human health and safety are small to non-existent. These types of devices can only be triggered through direct activation of the device. Therefore, if left undisturbed, these devices would pose no risk. WS would use these devices in compliance with applicable federal, state and local laws and regulations (WS Directive 2.210) as well as WS Directives. WS would not implement these methods in locations or in such a way they would pose hazards to WS staff or the public. When recommending these methods, WS would caution against their misuse. Because the use of these methods would be available under any of the alternatives and their use could occur whether WS was consulted or not, the risks to human health and safety would be similar among all the alternatives.

WS personnel are trained and experienced in the use of cannon/rocket nets, net guns, pyrotechnics, paintball markers, and firearms. WS employees who use these methods must comply with WS Directive 2.615 and all standards described in the WS Firearms Safety Training Manual. Directive 2.615 requires that personnel undergo regular training, adhere to a set of safety standards, submit to drug testing, and are subject to the Lautenberg Amendment. WS' recommendation that cannon/rocket nets, net guns, pyrotechnics, paintball markers, hunting, and/or shooting be used would not increase risks to human health and safety above those already inherent. When used appropriately and with consideration of human safety, risks associated with these methods are minimal. When recommending that these methods be used, WS would caution against their improper use. Because the use of these methods would be available under any of the alternatives and their use could occur whether WS was consulted or not, the risks to human health and safety would be similar among all the alternatives.

All chemical methods listed in Appendix E could be available under this alternative; although not all methods would be available for direct implementation by all persons (Mesurol and DRC-1339 formulations are only available for use by WS). The use of chemical methods is strictly regulated by the

DEA, EPA, FDA and VDACS. Chemical methods used or recommended by WS would be registered as required by federal and state law (see Appendix B). WS would use chemical methods in accordance with their label and WS Directive 2.401. When recommending chemical methods, WS would caution those persons against their misuse. Following label requirements eliminates risks to human health and safety.

The use of some pesticides (e.g., Avitrol, DRC-1339/Starlicide, Mesurol) is restricted to those persons who have been specifically trained and certified by the VDACS for their use. WS personnel that use restricted use pesticides would be certified as pesticide applicators by the Commonwealth of Virginia and would be required to wear appropriate PPE they are provided with (WS Directive 2.601).

Mesurol would be used by WS in accordance with the label, WS' Directives and SOPs to minimize risks to human health and safety. Mesurol can only be handled by properly licensed, equipped and trained applicators. Only these individuals may be in treated areas which must be posted with warning signs and monitored. Unconsumed eggs treated with Mesurol must be retrieved and disposed of in accordance with the label and applicable Federal and State laws. These and additional requirements for storage, transport and application eliminate the likelihood that humans would be exposed to Mesurol in the environment.

No significant impacts to human safety occurred from WS' use of methods to alleviate damage associated with birds in Virginia from FY 2011 to FY 2017.

The direct, indirect or cumulative risks to human safety from the use of chemical and non-chemical methods, when used appropriately and by trained personnel, is considered insignificant. The amount of chemicals used or stored by WS and cooperating agencies would be minimal to ensure human safety. Based on potential use patterns, the chemical and physical characteristics of the above mentioned chemical methods, and factors related to the environmental fate, no significant direct, indirect or cumulative impacts are expected from the chemical components used or recommended by the WS program.

Alternative 2 – WS Would Address Bird Damage by Providing Technical Assistance and Nonlethal Direct Operational Assistance

Under this alternative, WS could continue to provide those persons requesting assistance with managing damage and threats associated with birds with technical assistance as described in Alternative 1. Additionally, WS could provide direct operational assistance, but would only utilize nonlethal techniques. WS would not provide direct operational assistance utilizing lethal techniques. Despite this, those persons experiencing damage could continue to alleviate damage by employing both nonchemical and chemical methods. Not all methods would be available under this alternative. DRC-1339 formulations are only registered for use by WS and therefore would be unavailable under this alternative. However, Starlicide which contains the same active ingredient as DRC-1339 (3-chloro-p-toluidine hydrochloride) would still be available.

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

Direct, Indirect, and Cumulative Effects:
Risks to human health and safety from WS' use of or recommendation of nonlethal methods under this alternative would be similar to the proposed action / no action alternative.

Private use of lethal methods would be expected to increase under this alternative. This may result in less experienced persons implementing lethal damage management methods which may result in greater risks to human health and safety than the proposed action/no action alternative. Potential impacts to human health and safety from the recommendation of lethal methods by WS under this alternative would be variable. If lethal methods were employed as recommended by WS and according to label requirements, in the case of chemical methods, impacts to human health and safety would likely similar to the proposed action / no action alternative. However, if lethal methods were not employed as recommended or methods that are not recommended were employed, impacts could increase. However, impacts would not be expected to be significant.

Alternative 3 – WS Would Not Address Bird Damage

Under this alternative, WS would not be involved in any aspect of managing damage associated with birds. Therefore, WS would have no direct impact on human health and safety under this alternative. All requests for assistance received by WS to resolve damage caused by birds would be referred to the USFWS, the VDWR, the VDACS, local law enforcement or animal control authorities and/or private entities. Not all methods would be available under this alternative. Mesurol and DRC-1339 formulations are only registered for use by WS and therefore would be unavailable under this alternative. However, Starlicide which contains the same active ingredient as DRC-1339 (3-chloro-p-toluidine hydrochloride) would still be available.

Despite no involvement by WS in resolving damage and threats associated with birds, those persons experiencing damage could continue to alleviate damage by employing both non-chemical and chemical methods. This alternative would place the immediate burden of lethal operational damage management work on the resource owner, other government agencies, private businesses and/or private individuals. Those persons experiencing damage or threats could take action using those methods legally available to resolve or prevent damage as permitted by federal, Commonwealth, and local laws and regulations or those persons could take no action.

Direct, Indirect, and Cumulative Effects:
Potential impacts to human health and safety would be variable under this alternative. If direct operational assistance and technical assistance is not provided by WS or other entities, it is possible that frustration caused by the inability to reduce damage and threats along with ignorance on how best to reduce damage and threats could lead to the inappropriate use of legal methods and the use of illegal methods. Illegal, unsafe, and environmentally unfriendly actions could lead to higher risk to health and safety. However, if appropriate direct operational assistance and technical assistance was provided by persons knowledgeable and experienced in managing damage caused by birds, the risks would be similar to the other alternatives. Additionally, impacts would not be expected to be significant.

Issue 4 – Humaneness and Animal Welfare Concerns

As described in Chapter 2, humaneness and animal welfare concerns associated with methods available to reduce damage associated with birds has been identified as an issue. The humaneness and animal welfare concerns of the methods as they relate to the alternatives are discussed below.

Alternative 1 – WS Would Continue to Address Bird Damage through an Adaptive Integrated Approach (Proposed Action / No Action Alternative)

Under the proposed action / no action alternative, WS could provide both technical assistance and direct operational assistance to those persons requesting assistance.

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. Under this alternative, WS could employ or recommend methods viewed as inhumane by some persons. This could include WS killing or capturing and subsequently killing target animals using the best and most appropriate method(s) available. WS' use of methods under the proposed action / no action alternative would adhere to applicable state and local laws and regulations as well as WS' Directives (see Appendix E). These include but are not limited to guidelines for the types of devices or chemicals which can be used, frequency in which capture devices must be checked and way they must be applied. When recommending methods, WS would caution against their misuse.

The AVMA states "... euthanasia is the act of inducing humane death in an animal" and that "... if an animal's life is to be taken, it is done with the highest degree of respect, and with an emphasis on making the death as painless and distress free as possible" (AVMA 2013). Additionally, euthanasia methods should minimize any stress and anxiety experienced by the animal prior to unconsciousness. Although use of euthanasia methods to end an animal's life is desirable, as noted by the AVMA, for 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 use terms such as killing, collecting, or harvesting, recognizing that a distress-free death may not be possible (AVMA 2007).

AVMA (2013) notes, "While recommendations are made, it is important for those utilizing these recommendations to understand that, in some instances, agents and methods of euthanasia identified as appropriate for a particular species may not be available or may become less than an ideal choice due to differences in circumstances. Conversely, when settings are atypical, methods normally not considered appropriate may become the method of choice. Under such conditions, the humaneness (or perceived lack thereof) of the method used to bring about the death of an animal may be distinguished from the intent or outcome associated with an act of killing. Following this reasoning, it may still be an act of euthanasia to kill an animal in a manner that is not perfectly humane or that would not be considered appropriate in other contexts. For example, due to lack of control over free-ranging wildlife and the stress associated with close human contact, use of a firearm may be the most appropriate means of euthanasia. Also, shooting a suffering animal that is in extremis, instead of catching and transporting it to a clinic to euthanize it using a method normally considered to be appropriate (e.g., barbiturates), is consistent with one interpretation of a good death. The former method promotes the animal's overall interests by ending its misery quickly, even though the latter technique may be considered to be more acceptable under normal conditions (Yeates 2010). Neither of these examples, however, absolves the individual from her or his responsibility to ensure that recommended methods and agents of euthanasia are preferentially used."

AVMA (2013) recognizes that there is "an inherent lack of control over free-ranging wildlife," accepting that firearms may be the most appropriate approach to their euthanasia, and acknowledging that the quickest and most humane means of terminating the life of free-ranging wildlife in a given situation may not always meet all criteria established for euthanasia (i.e., distinguishes between euthanasia and methods that are more accurately characterized as humane killing). Because of the variety of situations that may be encountered, it is difficult to strictly classify methods for termination of free-ranging wildlife as acceptable, acceptable with conditions, or unacceptable. Furthermore, classification of a given method as a means of euthanasia or humane killing may vary by circumstances. These acknowledgments are not intended to condone a lower standard for the humane termination of wildlife. The best methods possible under the circumstances must be applied, and new technology and methods demonstrated to be superior to previously used methods must be embraced.

Direct, Indirect, and Cumulative Effects:
The efficacy and therefore, the humaneness of methods would be based on the skill and knowledge of the person employing methods. WS personnel are experienced professionals skilled in their use of methods. When selecting methods, WS evaluates all potential tools for their humaneness, effectiveness, ability to target specific species and individuals, as well as other factors. Consequently, management methods would be implemented by WS in the most humane manner possible. With the exception of DRC-1339 formulations and Mesurol, all methods listed in the Appendix E would be available for use under any of the alternatives (DRC-1339 formulations would not be available under Alternative 2 or Alternative 3, and Mesurol would not be available under Alternative 3). Although, DRC-1339 formulations would be unavailable under Alternatives 2 and 3, Starlicide which contains the same active ingredient (3-chloro-p-toluidine hydrochloride) would still be available. Therefore, the issue of humaneness associated with methods and any direct impacts would be similar across any of the alternatives since those methods could be employed in the absence of WS' involvement. 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 were used by WS as humanely as possible are listed in Chapter 2.

WS has improved the selectivity and humaneness of management techniques through research and development. Research is continuing to bring new findings and products into practical use. Until new findings and products are found practical, a certain amount of animal suffering could occur when some methods are used in situations where nonlethal damage management methods are not practical or effective. No indirect adverse impacts were identified for this issue.

Alternative 2 – WS Would Address Bird Damage by Providing Technical Assistance and Nonlethal Direct Operational Assistance

Under this alternative, WS could continue to provide those persons requesting assistance with managing damage and threats associated with birds with technical assistance as described in Alternative 1. Additionally, WS could provide direct operational assistance, but would only utilize nonlethal techniques. WS would not provide direct operational assistance utilizing lethal techniques. Despite this, those persons experiencing damage could continue to alleviate damage by employing both nonlethal and lethal methods. Not all methods would be available under this alternative. DRC-1339 formulations are only registered for use by WS and therefore would be unavailable under this alternative. However, Starlicide which contains the same active ingredient as DRC-1339 (3-chloro-p-toluidine hydrochloride) would still be available.

Despite no direct involvement by WS in the application of lethal methods, those persons experiencing damage could continue to alleviate damage by employing both nonlethal and lethal methods. The issue of humaneness of methods under this alternative is likely to be perceived as similar to humaneness issues discussed under the proposed action / no action alternative. This perceived similarity is derived from WS' recommendation of lethal methods that some consider inhumane. WS would not directly be involved with lethal damage management activities under this alternative. However, the recommendation of the use of lethal methods would likely result in the requester employing those methods. Therefore, by recommending methods and thus a requester employing those methods, the issue of humaneness would be like the proposed action / no action alternative.

Direct, Indirect, and Cumulative Effects:
Private use of lethal methods would be expected to increase under this alternative. WS could instruct and demonstrate the proper use of lethal methodologies to ensure methods are used in such a way as to minimize pain and suffering. However, the efficacy of methods employed by an individual would be based on the skill and knowledge of the requester in resolving the damage despite WS' demonstration.

Therefore, a lack of understanding of the behavior of birds or the improper identification of the animal causing damage along with inadequate knowledge and skill in using lethal methodologies to alleviate the damage or threats 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 / no action alternative. However, if those persons requesting assistance from WS apply lethal methods recommended by WS as intended, with skill and knowledge similar to that of WS, then those methods would be applied as humanely as possible to minimize pain and distress and the issue of humaneness would be similar to the proposed action / no action alternative. Additionally, if those persons provided technical assistance by WS apply lethal 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 animals would likely be higher.

Alternative 3 – WS Would Not Address Bird Damage

Under this alternative, WS would not be involved with any aspect of managing damage associated with birds. All requests for assistance received by WS to resolve damage associated with birds would be referred to the USFWS, the VDWR, the VDACS, local law enforcement or animal control authorities and/or private entities. Mesurol and DRC-1339 formulations would not be available under this alternative. However, Starlicide which contains the same active ingredient as DRC-1339 (3-chloro-p-toluidine hydrochloride) would still be available.

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

Direct, Indirect, and Cumulative Effects:
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 despite the method used. Despite the lack of involvement by WS under this alternative, those methods perceived as inhumane by certain individuals and groups would still be available to the public to use to alleviate damage and threats associated with birds. Therefore, those methods considered inhumane would continue to be available for use under this alternative. If those people experiencing damage apply those methods considered humane methods as intended and in consideration of the humane use of those methods, then the issue of method humaneness would be similar across the alternatives. If those persons experiencing damage were not provided with information and demonstration on the proper use of those methods and employed humane methods in ways that were inhumane, the issue of method humaneness could be greater under this alternative. However, the level at which people would apply humane methods inhumanely under this alternative based on a lack of assistance is difficult to determine and could just as likely be similar across the alternatives.

Issue 5 – Effects of Damage Management Activities on the Aesthetic Values of Birds

People often enjoy watching or hearing birds and take pleasure from knowing they exist as part of the natural environment. Methods available to alleviate damage are intended to disperse and/or remove birds in the area where damage is occurring. Therefore, these activities have the potential to affect the aesthetic values of birds depending upon the values, philosophies, attitudes and opinions of individuals. The effects on the aesthetic value of birds as it relates to the alternatives are discussed below. No indirect effects were identified for this issue.

Alternative 1 – WS Would Continue to Address Bird Damage through an Adaptive Integrated Approach (Proposed Action / No Action Alternative)

Under the proposed action / no action alternative, WS could provide both technical assistance and direct operational assistance to those persons requesting assistance. The implementation or recommendation of methods by WS under this alternative would likely result in the dispersal, exclusion, or removal of individual animals to alleviate damage and threats. In some instances when animals were dispersed, excluded or removed, the ability of interested persons to observe and enjoy these animals could temporarily decline. Those animals dispersed or removed by WS under this alternative, would likely be those same animals that could and likely would be dispersed, excluded or removed by those individuals experiencing damage in the absence of assistance from WS. Since those animals dispersed or removed by WS under this alternative could be removed by other entities, WS' involvement would not likely be additive to the number of animals that could be removed in the absence of WS' involvement. The lethal removal of birds addressed in this EA may occur under migratory bird depredation permits issued by the USFWS, during regulated harvest seasons, under 50 CFR 21.43 (blackbird depredation order), or under §29.1-529 of the Code of Virginia. Lethal removal of non-native birds addressed in this EA may occur without a permit or authorization.

Direct, Indirect, and Cumulative Effects:
WS' lethal removal of birds over the last seven years has been of low magnitude when compared to bird populations. Given the limited lethal removal proposed by WS under this alternative when compared to bird populations or the private harvest of these birds, bird damage management activities conducted by WS pursuant to the proposed action / no action alternative would not adversely affect the aesthetic value of birds.

When damage associated with birds has occurred, any removal of animals by the property or resource owner would likely occur whether WS was involved with taking the animals or not. Therefore, the activities of WS are not expected to have any direct, indirect or cumulative adverse effects on this element of the human environment if occurring at the request of a property owner and/or manager.

Alternative 2 – WS Would Address Bird Damage by Providing Technical Assistance and Nonlethal Direct Operational Assistance

Under this alternative, WS could continue to provide those persons requesting assistance with managing damage and threats associated with birds with technical assistance as described in Alternative 1. Additionally, WS could provide direct operational assistance, but would only utilize nonlethal techniques. WS would not provide direct operational assistance utilizing lethal techniques. Despite this, those persons experiencing damage could continue to alleviate damage by employing both nonlethal and lethal methods. Not all methods would be available under this alternative. DRC-1339 formulations are only registered for use by WS and therefore would be unavailable under this alternative. The number of animals addressed under this issue is likely to be the same as the number addressed under the proposed action / no action alternative.

Direct, Indirect, and Cumulative Effects:
Since animals could continue to be dispersed, excluded or removed under this alternative, despite WS' lack of direct involvement in the application of lethal methods, the aesthetic values associated with birds would likely be similar to the other alternatives. The lack of WS' direct involvement in the implementation of lethal methods would not lead to a reduction in the number of animals lethally removed since WS has no authority to regulate the dispersal, exclusion or removal of birds. That authority rests with the USFWS, the VDWR, VDACS, or local law enforcement or animal control authorities. Because those individuals experiencing damage could and likely would continue to employ lethal methods despite WS' lack of direct involvement under this alternative, the impacts to the aesthetic value of birds and any direct, indirect or cumulative impacts would be similar to the other alternatives. Impacts would only be lower than the proposed action / no action alternative if those individuals experiencing damage were not as diligent in employing methods as WS would be if conducting lethal direct operational assistance. If those people experiencing damage abandoned the use of those methods, then those birds associated with the damage would likely remain in the area and available for observing by those people interested in doing so.

Alternative 3 – WS Would Not Address Bird Damage

Under this alternative, WS would not be involved with any aspect of bird damage management. Therefore, WS would have no direct impact on the aesthetic values of birds under this alternative. All requests for assistance received by WS to resolve damage associated with birds would be referred to the USFWS, the VDWR, the VDACS, local law enforcement or animal control authorities and/or private entities. Despite no involvement by WS in resolving damage and threats associated with birds, those persons experiencing damage could continue to alleviate damage by employing both nonlethal and lethal methods. DRC-1339 formulations and Mesurol would not be available under this alternative.

Direct, Indirect, and Cumulative Effects:
Since animals could continue to be dispersed, excluded or removed under this alternative, despite WS' lack of involvement, the ability to watch or hear these animals would likely be similar to the other alternatives. The lack of WS' involvement would not lead to a reduction in the number of animals dispersed, excluded or removed since WS has no regulatory authority. That authority rests with the USFWS, the VDWR, VDACS, or local law enforcement or animal control authorities. Under this alternative, those individuals experiencing damage could and likely would continue to employ both lethal and nonlethal methods, despite WS' lack of involvement. Therefore, the impacts to the aesthetic value of birds and any direct, indirect or cumulative impacts would be similar to the other alternatives. Impacts would only be lower than the proposed action / no action alternative if those individuals experiencing damage were not as diligent in employing methods as WS would be if conducting direct operational assistance. If those people experiencing damage abandoned the use of those methods, then the birds associated with the damage would likely remain in the area and available for observing by those people interested in doing so.

3.2 ISSUES NOT CONSIDERD FOR COMPARATIVE ANALYSIS

The following resource values in the state are not expected to be significantly impacted by any of the alternatives analyzed as none of the alternatives cause any significant ground disturbance: soils, geology, minerals, water quality/quantity, flood plains, critical habitats (areas listed in threatened and endangered species recovery plans), visual resources, air quality, prime and unique farmlands, aquatic resources, timber, and range. Therefore, these resources will not be analyzed.

Additional issues were identified by WS during the scoping process of this EA. Those issues were considered by WS during the development of this EA. However, those issues will not be analyzed in detail for the reasons provided. The following issues will not be analyzed in detail in this EA:

Effects of Bird Damage Management Activities on Biodiversity

An issue identified as a concern is that managing bird damage could affect biodiversity or the diversity of species. When managing damage, WS does not attempt to eradicate any species of native wildlife. The purpose of damage management is to reduce or alleviate the damage or threats of damage by targeting individuals or groups of animals identified as causing damage or posing a threat of damage. Birds are managed by the USFWS and/or the VDWR. Lethal removal of these animals can only occur at the discretion of the USFWS and/or the VDWR, which ensures that removal occurs to achieve desired population objectives for these species. Free-ranging domestic and feral chickens, guinea fowl, or peafowl are managed by local law enforcement and animal control authorities. Therefore, any decision regarding the management occurs at their discretion. Any reduction of a local population would be temporary because immigration from adjacent areas or reproduction would replace those animals removed. Therefore, damage management activities conducted pursuant to any of the alternatives would not adversely affect biodiversity.

A Loss Threshold Should Be Established Before Allowing Lethal Methods

An issue commonly identified as a concern is that a threshold of damage or economic loss should be established and reached before lethal methods can be used to resolve damage and that damage caused by birds should be a cost of doing business. For any given damage situation, there are varying thresholds of tolerance exhibited by those people affected. The point at which people begin to implement damage management methods are often unique to the individual and can be based on many factors (e.g., economic, social, aesthetics). How damage is defined is also often unique to the individual and damage occurring to one individual may not be considered damage by another individual. Therefore, the threshold of damage or economic loss that can be tolerated is also unique to the individual.

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. Under any of the alternatives, animals causing damage or posing threats could be lethally removed with firearms. Lead is a metal that can be poisonous to animals. Risk of lead exposure to birds occurs primarily when they ingest lead shot or bullet fragments. Lead ammunition may be used by any person implementing damage management methods under any of the alternatives. However, those persons using firearms to take birds under 50 CFR 21.43 or under depredation permits must use non-toxic shot. Additionally, the state of Virginia requires hunters use non-toxic shot for the harvest of Wilson's snipe, clapper rail and Virginia rail (4 VAC 15-260-140).

Deposition of lead into soil could occur if, during the use of a rifle, the projectile passes through an animal, if misses occur, or if the carcass is not retrieved. Laidlaw et al. (2005) reported that, because of the low mobility of lead in soil, all 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 have been raised that lead from bullets introduced into the environment from shooting activities could lead to the contamination of either ground water or surface water from runoff. The amount of lead that becomes soluble in soil is usually very small (0.1–2.0%) (EPA 2005). Stansley et al. (1992) studied lead levels in water that was directly subjected to high concentrations of lead shot because of intensive target shooting at shooting ranges. The study detected elevated lead levels in water in a stream and a marsh that were in the shot "fall zones" at one shooting range, but did not find higher lead levels in a lake into which the stream drained, with the

exception of one sample collected near a parking lot (Stansley et al. 1992). Stansley et al. (1992) believed the lead contamination near the parking lot was due to runoff from the lot, and not from the shooting range. Stansley et al. (1992) also indicated that even when lead shot has accumulated at high levels in areas with permanent water bodies present, the lead does not necessarily cause elevated lead contamination of water downstream. Ingestion of lead shot, bullets or associated fragments is not considered a significant risk to fish and amphibians (Rattner et al. 2008). 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). These studies suggest that the very low amounts of lead that could be deposited from damage management activities would have minimal effects on lead levels in soil and water.

Lead ammunition (for hunting or target shooting) is only one of many sources of lead in the environment. Other sources which can settle into soil and water include lost fishing sinkers (an approximated 3,977 metric tons of lead fishing sinkers are sold in the United States annually; Rattner et al. 2008), and airborne emissions from metal industries (e.g., lead smelters, iron production, steel production), manufacturing industries, and waste incineration (EPA 2013*a*). Since lethal removal of those species addressed in this EA can occur at any time or during hunting seasons, WS' assistance with removing animals causing damage would not be additive to the environmental status quo. The amount of lead deposited into the environment may be lowered by WS' involvement in activities due to efforts by WS to ensure projectiles do not pass through, but are contained within the carcass, which would limit the amount of lead potentially deposited into soil from projectiles passing through the carcass. The proficiency training received by WS' employees in firearm use and accuracy increases the likelihood that animals are lethally removed humanely in situations that ensure accuracy and that misses occur infrequently, which would further reduce the potential for lead to be deposited in the soil from misses or from projectiles passing through carcasses. In addition, WS' involvement would ensure efforts were made to retrieve and dispose of carcasses lethally removed using firearms to prevent the ingestion of lead in carcasses by scavengers. Based on current information, the risks associated with lead bullets that would be deposited into the environment from WS' activities due to misses, the bullet passing through the carcass, or from carcasses that may be irretrievable would be below any level that would pose any risk from exposure or significant contamination.

Damage Management Should Not Occur at Taxpayer Expense

An issue was raised that damage management should not be provided at the expense of taxpayers. Activities conducted by WS to manage damage or threats associated with birds in Virginia may be funded by a variety of sources including, but not limited to, federal appropriations, the Commonwealth of Virginia, and other cooperative funding. These activities include both technical assistance and direct operational assistance, when requested. Under the proposed action, funding could come from these and/or other sources. A federal appropriation is allotted for the maintenance of the WS-Virginia program. The remainder of the WS-Virginia program is funded by cooperative, federal, and non-federal funding.

Impacts of Dispersing Birds on People in Urban and Suburban Areas

An issue commonly identified is that the effective implementation of nonlethal methods at one location will result in damage occurring at a new location(s). This is of particular concern in large metropolitan areas where it is less likely that birds dispersed from one roost location will find a new roost location where damage will not occur. In these situations, the problem can be mitigated by utilizing a community-based decision making co-managerial approach (see **2.2 *Community-based Decision Making***). In these instances, if damage management activities are supported by or provided by the municipality in which a

roost is located, damage management activities can occur anywhere in the municipality where bird roosts occur, eliminating the likelihood that birds will be able to establish a new roost within the municipality.

3.3 SUMMARY OF ENVIRONMENTAL CONSEQUENCES UNDER THE PROPOSED ACTION / NO ACTION ALTERNATIVE

No significant cumulative environmental impacts are expected from any of the three Alternatives. Under the proposed action /no action alternative, the lethal removal of birds by WS would not have a significant impact on overall populations, but some short-term local reductions may occur. Additionally, WS would not have a significant direct, indirect, or cumulative impact on the ability of hunters to harvest species targeted by management activities. WS would not have a significant direct, indirect or cumulative impact on nontarget animal populations or threatened and endangered species. Under the proposed action / no action alternative, direct impacts to human health and safety would be low, and indirect and cumulative impacts would be eliminated when methods are used appropriately in adherence with SOPs and label requirements by trained personnel. Similarly, adherence to SOPs and selection and implementation of methods by trained personnel ensures methods would be implemented in the most humane manner possible under the proposed action / no action alternative. Any direct, indirect or cumulative impacts on humaneness would be in part up to a person's perception of humaneness and similar across the alternatives. Under the proposed action / no action alternative, the aesthetic values of birds are not expected to be impacted directly, indirectly or cumulatively. WS' actions taken to minimize or eliminate damage would be constrained in scope, duration and intensity, for the purpose of minimizing or avoiding impacts. WS' SOPs are designed to reduce the potential negative effects of WS' actions by identifying and responding to both anticipated and unanticipated changes in wildlife populations and the environment. WS continually monitors, evaluates and makes modifications as necessary to methods or strategy when providing assistance, to not only reduce damage, but also to identify and minimize potentially harmful effects. This process allows WS to take into consideration other influences in the environment in order to avoid adverse impacts. Although some persons will likely be opposed to WS' participation in damage management activities, the analysis in this EA indicates that WS' integrated damage management program to reduce damage or threats associated with birds, as described in the proposed action/ no action alternative, would not result in significant adverse cumulative impacts on the quality of the human environment.

CHAPTER 4 - LIST OF PREPARERS AND PERSONS CONSULTED

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APPENDIX A: LITERATURE CITED

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APPENDIX B: SPECIES OF BIRDS ADDRESSED IN THE EA AND agricultural (A), natural (N), property (P), and human health and safety (H) RESOURCES IMPACTED BY THESE SPECIES

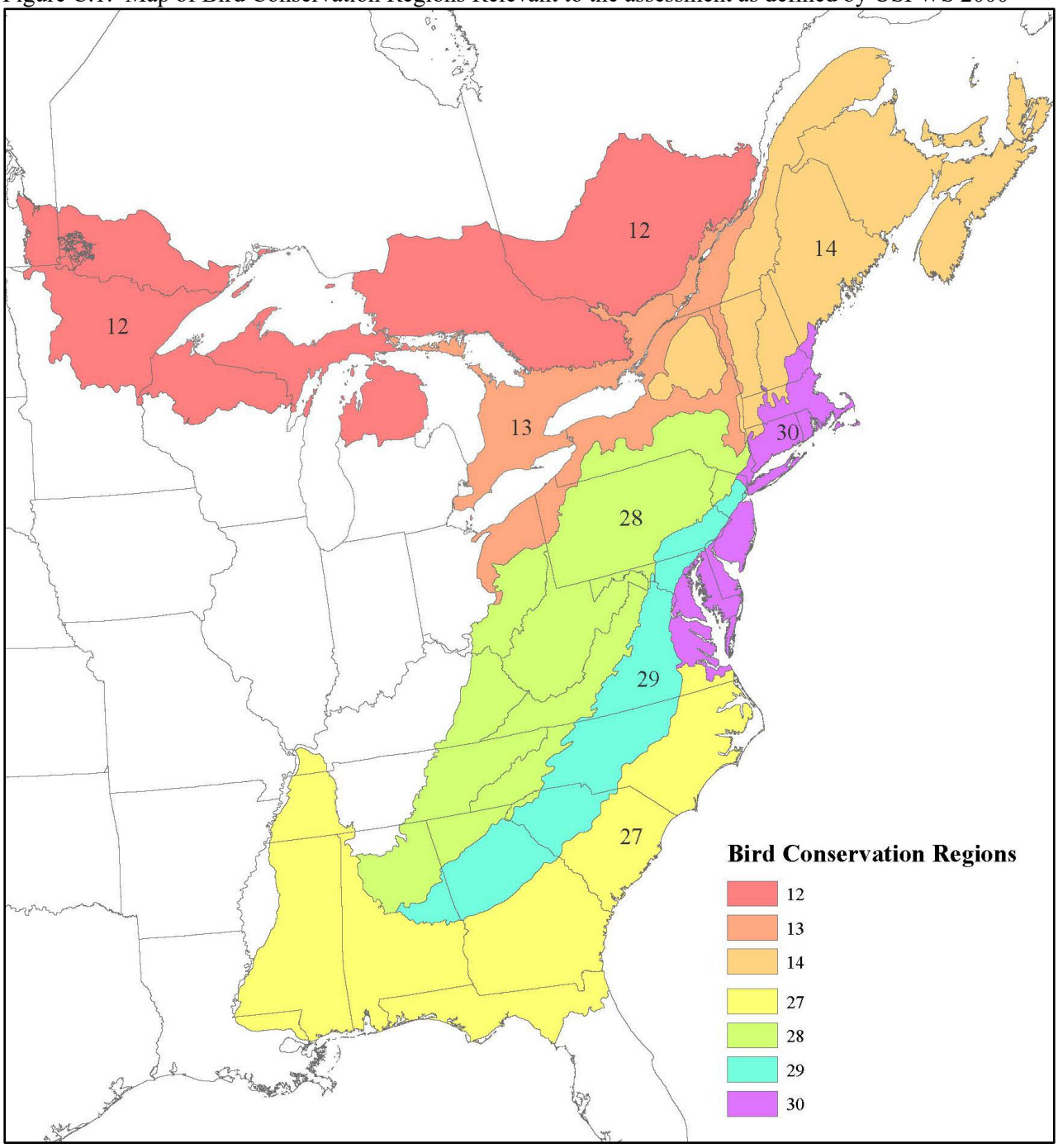
Species	Resource			
	A	N	P	H
northern bobwhite (*Colinus virginianus*)			X	X
wild turkey (*Meleagris gallopavo*)	X		X	X
pied-billed grebe (*Podilymbus podiceps*)	X		X	X
horned grebe (*Podiceps auritus*)	X		X	X
red-necked grebe (*Podiceps grisegena)*	X		X	X
rock pigeons (*Columba livia*)	X	X	X	X
Eurasian collared-dove (*Streptopelia decaocto*)	X		X	X
mourning dove (*Zenaida macroura*)	X		X	X
common nighthawk (*Chordeiles minor*)			X	X
chimney swift (*Chaetura pelagica*)			X	X
clapper rail (*Rallus crepitans*)			X	X
Virginia rail (*Rallus limicola*)			X	X
sora (*Porzana carolina*)			X	X
sandhill crane (*Antigone canadensis*)	X		X	X
black-bellied plover (*Pluvialis squatarola*)			X	X
American golden-plover (*Pluvialis dominica*)			X	X
semipalmated plover (*Charadrius semipalmatus)*			X	X
killdeer (*Charadrius vociferous*)			X	X
upland sandpiper (*Bartramia longicauda*)			X	X
whimbrel (*Numenius phaeopus*)			X	X
ruddy turnstone (*Arenaria interpres*)			X	X
stilt sandpiper (*Calidris himantopus*)			X	X
sanderling (*Calidris alba*)			X	X
dunlin (*Calidris alpine*)			X	X
least sandpiper (*Calidris minutilla*)			X	X
pectoral sandpiper (*Calidris melanotos*)			X	X
semipalmated sandpiper (*Calidris pusilla*)			X	X
western sandpiper (*Calidris mauri*)			X	X
short-billed dowitcher (*Limnodromus griseus*)			X	X
American woodcock (*Scolopax minor*),			X	X
Wilson's snipe (*Gallinago delicate*)			X	X
lesser yellowlegs (*Tringa flavipes*)			X	X
willet (*Tringa semipalmata*)			X	X
greater yellowlegs (*Tringa melanoleuca)*			X	X
Bonaparte's gull (*Chroicocephalus philadelphia*)	X		X	X
laughing gull (*Leucophaeus atricilla*)	X	X	X	X
ring-billed gull (*Larus delawarensis*)	X		X	X
herring gull (*Larus argentatus*)	X	X	X	X
great black-backed gull (*Larus marinus*)	X	X	X	X
lesser black-backed gull (*Larus fuscus*)			X	X
least tern (*Sternula antillarum*)			X	X
gull-billed tern (*Gelochelidon nilotica*)			X	X
Caspian tern (*Hydroprogne caspia*)			X	X
common tern (*Sterna hirundo*)			X	X
royal tern (*Thalasseus maximus)*			X	X

black skimmer (*Rynchops niger*)			X	X
common loon (*Gavia immer*)	X		X	X
northern gannet (*Morus bassanus*)			X	X
anhinga (*Anhinga anhinga*)	X		X	X
double-crested cormorant (*Phalacrocorax auritus*)	X	X	X	X
brown pelican (*Pelecanus occidentalis*)	X		X	X
American bittern (*Botaurus lentiginosus*)	X		X	X
great blue heron (*Ardea Herodias*)	X		X	X
great egret (*Ardea alba*)	X		X	X
snowy egret (*Egretta thula*)	X		X	X
little blue heron (*Egretta caerulea*)	X		X	X
cattle egret (*Bubulcus ibis*)	X		X	X
green heron (*Butorides virescens*)	X		X	X
black-crowned night-heron (*Nycticorax nycticorax*)	X		X	X
yellow-crowned night-heron (*Nyctanassa violacea*)	X		X	X
white ibis (*Eudocimus albus*)	X		X	X
glossy ibis (*Plegadis falcinellus*)	X		X	X
black vulture (*Coragyps atratus*)	X	X	X	X
turkey vulture (*Cathartes aura*)			X	X
osprey (*Pandion haliaetus*)	X		X	X
Mississippi kite (*Ictinia mississippiensis*)			X	X
northern harrier (*Circus hudsonicus*)	X		X	X
sharp-shinned hawk (*Accipiter striatus*)	X		X	X
Cooper's hawk (*Accipiter cooperii*)	X		X	X
red-shouldered hawk (*Buteo lineatus*)	X		X	X
broad-winged hawk (*Buteo platypterus*)			X	X
red-tailed hawk (*Buteo jamaicensis*)	X		X	X
rough-legged hawk (*Buteo lagopus*)			X	X
barn owl (*Tyto alba*)			X	X
eastern screech-owl (*Megascops asio*)			X	X
great horned owl (*Bubo virginianus*)	X	X	X	X
snowy owl (*Bubo scandiacus*)			X	X
barred owl (*Strix varia*)	X		X	X
long-eared owl (*Asio otus*)			X	X
short-eared owl (*Asio flammeus*)			X	X
belted kingfisher (*Megaceryle alcyon*)	X		X	X
red-headed woodpecker (*Melanerpes erythrocephalus*)			X	X
red-bellied woodpecker (*Melanerpes carolinus*)			X	X
yellow-bellied sapsucker (*Sphyrapicus varius*)	X		X	X
downy woodpecker (*Dryobates pubescens*)			X	X
hairy woodpecker (*Dryobates villosus*)			X	X
northern flicker (*Colaptes auratus*)			X	X
pileated woodpecker (*Dryocopus pileatus*)			X	X
American kestrel (*Falco sparverius*)			X	X
merlin (*Falco columbarius*)			X	X
peregrine falcon (*Falco peregrinus*)		X	X	X
monk parakeet (*Myiopsitta monachus*)		X	X	X
eastern kingbird (*Tyrannus tyrannus*)			X	X
blue jay (*Cyanocitta cristata*)			X	X

American crow (*Corvus brachyrhynchos*)	X	X	X	X
fish crow (*Corvus ossifragus*)	X	X	X	X
common raven (*Corvus corax*)	X	X	X	X
horned lark (*Eremophila alpestris*)			X	X
purple martin (*Progne subis*)			X	X
tree swallow (*Tachycineta bicolor*)	X		X	X
northern rough-winged swallow (*Stelgidopteryx serripennis*)			X	X
bank swallow (*Riparia riparia*)			X	X
cliff swallow (*Petrochelidon pyrrhonota*)			X	X
cave swallow (*Petrochelidon fulva*)			X	X
barn swallow (*Hirundo rustica*)	X		X	X
eastern bluebird (*Sialia sialis*)			X	X
American robin (*Turdus migratorius*)			X	X
northern mockingbird (*Mimus polyglottos*)			X	X
European starling (*Sturnus vulgaris*)	X	X	X	X
cedar waxwing (*Bombycilla cedrorum*)			X	X
house sparrow (*Passer domesticus*)	X	X	X	X
house finch (*Haemorhous mexicanus*)			X	X
American goldfinch (*Spinus tristis*)			X	X
lapland longspur (*Calcarius lapponicus*)			X	X
chipping sparrow (*Spizella passerina*)			X	X
field sparrow (*Spizella pusilla*)			X	X
savannah sparrow (*Passerculus sandwichensis*)			X	X
grasshopper sparrow (*Ammodramus savannarum*)			X	X
song sparrow (*Melospiza melodia*)			X	X
dark-eyed junco (*Junco hyemalis*)			X	X
bobolink (*Dolichonyx oryzivorus*)			X	X
eastern meadowlark (*Sturnella magna*)			X	X
red-winged blackbird (*Agelaius phoeniceus*)	X		X	X
brown-headed cowbird (*Molothrus ater*)	X	X	X	X
rusty blackbird (*Euphagus carolinus*)	X		X	X
Brewer's blackbird (*Euphagus cyanocephalus*)	X		X	X
common grackle (*Quiscalus quiscula*)	X	X	X	X
boat-tailed grackle (*Quiscalus major*)	X		X	X
yellow-rumped warbler (*Setophaga coronata*)			X	X
northern cardinal (*Cardinalis cardinalis*)			X	X
indigo bunting (*Passerina cyanea*)			X	X
free ranging domestic and feral chickens (*Gallus gallus domesticus*)	X		X	X
free ranging domestic and feral guinea fowl (*Numididae*)	X		X	X
free ranging domestic and feral peafowl (*Pavo*)	X		X	X

APPENDIX C: BIRD CONSERVATION REGIONS AND BREEDING BIRD SURVEY REGIONS

Figure C.1: Map of Bird Conservation Regions Relevant to the assessment as defined by USFWS 2000



Bird Conservation Regions (BCR) are areas in North America that are characterized by distinct ecological habitats and that have similar bird communities and resource management issues. The Commonwealth of Virginia lies within the Southeastern Coastal Plain (BCR 27), Appalachian Mountains (BCR 28), Piedmont (BCR 29) and the New England / Mid-Atlantic Coast (BCR 30) regions (USFWS 2000; see Figure C.1). BCR 27 and BCR 30 were modified by the North American Waterbird Conservation Plan for the purposes of the regional shorebird plans (see ***North American Waterbird Conservation Plan***). In

those plans, watersheds draining into the Chesapeake Bay are included in BCR 30 (and excluded from BCR 27) (Hunter et al. 2006). Other relevant BCRs are the Atlantic Northern Forest region (BCR 14), the Lower Great Lakes / St. Lawrence Plain region (BCR 13) and the Boreal Hardwood Transition (BCR 12). Although these regions do not include any of the land area of Virginia, several of the bird species addressed in this analysis breed in these areas and cause damage or threats of damage in Virginia during the non-breeding season. For these species, the only available population data is the number of birds breeding in these regions.

In this analysis, both the eastern BBS region and survey wide BBS trend data is presented (Figure C.2). These regions first defined by Bystrak (1981) were later modified to correspond with BCR regions (USGS 2019).

Figure C.2: Breeding Bird Survey Regions Relevant to the Assessment

APPENDIX D: BIRDS OF CONSERVATION CONCERN IN USFWS'S NORTHEAST REGION[1]

[1]List obtained from (USFWS 2008b).

Common Name	Scientific Name
red-throated loon	*Gavia stellata*
pied-billed grebe	*Podilymbus podiceps*
horned grebe	*Podiceps auritus*
greater shearwater	*Ardenna gravis*
Audubon's shearwater	*Puffinus lherminieri*
American bittern	*Botaurus lentiginosus*
least bittern	*Ixobrychus exilis*
snowy egret	*Egretta thula*
bald eagle	*Haliaeetus leucocephalus*
peregrine falcon	*Falco peregrinus*
yellow rail	*Coturnicops noveboracensis*
black rail	*Laterallus jamaicensis*
Wilson's plover	*Charadrius wilsonia*
American oystercatcher	*Haematopus palliatus*
solitary sandpiper	*Tringa solitaria*
lesser yellowlegs	*Tringa flavipes*
upland sandpiper	*Bartramia longicauda*
whimbrel	*Numenius phaeopus*
Hudsonian godwit	*Limosa haemastica*
marbled godwit	*Limosa fedoa*
red knot	*Calidris canutus*
semipalmated sandpiper	*Charadrius semipalmatus*
purple sandpiper	*Calidris maritima*
buff-breasted sandpiper	*Calidris subruficollis*
short-billed dowitcher	*Limnodromus griseus*
least tern	*Sternula antillarum*
gull-billed tern	*Gelochelidon nilotica*
Arctic tern	*Sterna paradisaea*
black skimmer	*Rynchops niger*
short-eared owl	*Asio flammeus*
whip-poor-will	*Antrostomus vociferus*
red-headed woodpecker	*Melanerpes erythrocephalus*
olive-sided flycatcher	*Contopus cooperi*
loggerhead shrike	*Lanius ludovicianus*
Bewick's wren	*Thryomanes bewickii*
sedge wren	*Cistothorus platensis*
Bicknell's thrush	*Catharus bicknelli*
wood thrush	*Hylocichla mustelina*
blue-winged warbler	*Vermivora cyanoptera*
golden-winged warbler	*Vermivora chrysoptera*

prairie warbler	*Setophaga discolor*
bay-breasted warbler	*Setophaga castanea*
cerulean warbler	*Setophaga cerulea*
worm-eating warbler	*Helmitheros vermivorum*
Swainson's warbler	*Limnothlypis swainsonii*
Kentucky warbler	*Geothlypis formosa*
Canada warbler	*Cardellina canadensis*
Henslow's sparrow	*Ammodramus henslowii*
Nelson's sharp-tailed sparrow	*Ammodramus nelsoni*
saltmarsh sharp-tailed sparrow	*Ammodramus caudacutus*
seaside sparrow	*Ammodramus maritimus*
rusty blackbird	*Euphagus carolinus*

APPENDIIX E: METHODS AVAILABLE FOR PREVENTING, REDUCING AND ELIMINATING BIRD DAMAGE AND THREATS IN THE COMMONWEALTH OF VIRGINIA

A variety of methods are potentially available to address damage associated with birds. Various Federal, State, and local statutes and regulations and WS Directives govern WS' use of these methods. The following methods and materials may be recommended or used in technical assistance and direct damage management efforts of the VA WS program. Not all methods would be considered effective, efficient, practical, or legal in every situation and may not be recommended or utilized.

NON-LETHAL METHODS (NON-CHEMICAL)

RESOURCE MANAGEMENT

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

Animal Husbandry: This category includes: 1) modifications in the level of care and attention given to livestock (including fish and other commercially raised aquatic organisms), 2) selection of livestock type (e.g., baitfish vs. mollusk) or species, 3) shifts in the timing or location of breeding, 4) moving livestock to locations where predation has historically been low when livestock is most vulnerable, 5) disposal of dead livestock so that it cannot serve as an attractant, 6) close monitoring (e.g., herding) of livestock, and 7) changes in feeding (e.g., type of feed, timing). Altering animal husbandry to reduce damage associated with birds has many limitations. The expense associated with a change in husbandry practice may exceed the savings. WS encourages resource owners to use these strategies where they may be beneficial.

Crop Selection and Scheduling: Changes in crop selection and scheduling includes, but is not limited to: planting different crops or varieties that are less attractive to the birds causing damage, planting crops at an earlier or later date to coincide with periods when there is a greater availability of other food items, or planting a larger area. This practice depends on the species causing damage, the availability of alternate food sources, and the market for alternative crops. Research has been conducted on damage resistant crop varieties with little success.

Lure Crops: If depredation cannot be avoided by careful crop selection or a modified planting schedule, lure crops can sometimes be used to mitigate the potential loss. Lure crops are crops planted or left for consumption by wildlife as an alternate food source. To improve the efficacy of this technique, frightening devices should be used in nearby non-lure crop fields and wildlife should not be disturbed in lure crop fields. This approach provides relief for critical crops by sacrificing less important or specifically planted fields. Establishing lure crops is sometimes expensive, requires considerable time and planning to implement, and may attract other unwanted species to the area. Implementation of this method is limited by the authority of those involved to manage the property.

Habitat Management: In general, the type, quality, and quantity of habitat are directly related to the species of wildlife in an area. Therefore, it is possible to manage habitat in a way that discourages its use by specific species. Some examples include: 1) eliminating, modifying or restricting access to water sources (e.g., turning off water aerators in ponds to allow the water to freeze in the winter): 2) eliminating, modifying, or restricting access to food resources (e.g., removing fruit-bearing ornamental trees at an airport); 3) eliminating or modifying vegetation or structures used for perching, loafing, roosting or nesting; or 4) providing alternative resources away from the location where damage is occurring. The limitations of habitat management as a method of reducing wildlife damage are

determined by the characteristics of the species involved, the nature of the damage, economic feasibility, and other factors. Legal constraints may also exist which preclude altering particular habitats (e.g., wetlands). In most cases, the resource or property owner or manager is responsible for implementing habitat modifications, and WS only provides advice on the type of modifications that have the best chance of achieving the desired effect.

Modification of Human Behavior: Altering human behavior may resolve conflicts between humans and animals. For example, the USAF and the USN allow for the alteration of flight schedules to avoid periods of time when there is high bird activity (e.g., large flocks of birds present) (USAF 2018, USN 2018). Eliminating the feeding of wildlife and free-ranging or feral animals may reduce the presence of animals in a given area and with it the damage occurring. This includes inadvertent feeding. In Virginia, it is illegal for any person to place, distribute, or allow the placement of food, minerals, carrion, trash, or similar substances when it attracts any species of wildlife in such numbers or circumstances to cause property damage, endanger any person or wildlife, or create a public health concern (4 VAC 14-40-286). The public does not always comply with laws and ordinances and these statutes must be enforced to be effective.

EXCLUSION

Exclusion methods restrict the access of birds to resources or areas where damage is occurring. These methods can effectively prevent damage in many situations. However, exclusionary devices which are 100% effective at excluding birds can be more costly than the value of the resources being protected, especially for large areas. In addition, some exclusionary devices require labor intensive maintenance which can further reduce their cost-effectiveness. Exclusion devices may also interfere with the intended use of resources, human access, or routine maintenance at a site. Exclusion methods maybe complete, partial or perceptual.

Fencing: Fences, either temporary or permanent, electric or conventional, can be effective in excluding birds. With any type of fencing the height of the fence must be tall enough, and the distance between the fence and the ground or the distance between wires or pickets must be small enough to exclude animals. Birds are able to fly, climb, jump over or move through fences if motivated. For this reason, fences may not be effective at excluding birds. Fences work best when birds are flightless (or prefer not to fly), or when the area being excluded is small and birds are not sufficiently motivated to fly, climb, jump over or move through them.

Perceptual barriers: There are several types of exclusion methods that monopolize wildlife's ability to perceive something as a barrier. In other words, although the method does not actually prohibit movement, the animal perceives a barrier. Examples include but are not limited to fladry, pole barriers (Zuberogoitia et al. 2015) and a variety of products associated with reducing bird collisions with glass (American Bird Conservancy 2020).

Fladry: Fladry is a barrier technique that attaches small pieces of flagging to either a temporary or permanent electrified or un-electrified fencing. The movement of the flags in the wind makes a visual barrier which acts as a deterrent.

Surface Coverings: Generally alighted horizontally above the area to be protected, surface coverings may include but are not limited to netting, wire grid systems, and floating covers. Although not economical for large areas, netting can be used to restrict access to small ponds or other resources. Wire grid systems (also called overhead wires) are composed of multiple lines of wire, nylon string or analogous material stretched above the area to be protected (e.g., a pond). Wires may be arranged parallel to one another, in a grid, in spoke-like fashion or in a random array (Terry 1987, Pochop et al. 1990,

Steuber et al. 1995, Clark et al. 2013). Although wire grid systems may not create an actual barrier, they interfere with the flight patterns of birds and may limit their use of the area where the system is installed. Floating covers consist of either a system of plastic sheeting and baffle floats or, alternatively, plastic balls or spheres which sit on and fully cover the surface of a body of water. Both the plastic sheet and ball/sphere systems are intended to rise and fall with changing water levels and work by restricting access to the water's surface.

Enclosures/Confinement: Made of a variety of materials (e.g., wood, woven metal wire, netting, wood or metal supports), enclosures may either be partially open (e.g., at the bottom) or be fully enclosed. They may be open to the elements (e.g., cage surrounding poultry vulnerable to predation) or not (e.g., sheep and lambs confined to a barn during lambing). Enclosures surround the resource(s) to be protected (e.g., high value crops, livestock). They may be constructed to exclude the bird species causing damage but allow necessary access to the resource being protected. For example, predator enclosures which restrict predator access to piping plover nests allow incubating adult piping plovers access to their nests.

Other Barriers and Exclusionary Methods: The installation of flashing, hardware cloth, steel wool, copper gauze, sheet metal, foam caulk, quick setting concrete, plastic strip curtains, strands of wire or monofilament (e.g., Birdwire®), spikes (e.g., Nixalite™, Catclaw™), or other materials and/or modifications to the area where damage is occurring can restrict bird's access to resources (e.g., nesting sites, perching locations etc.). Used in conjunction with other physical exclusion methods these methods can be applied, arranged or designed to effectively exclude birds.

FRIGHTENING DEVICES OR DETERRENTS

Frightening devices are used to repel animals from areas where they are causing damage or posing threats of damage. The success of frightening methods depends on an animal's fear of, and subsequent aversion to, offensive stimuli. A persistent effort is usually required to effectively apply frightening techniques and the techniques must be sufficiently varied to prolong their effectiveness. Over time, animals often habituate to commonly used scare tactics and ignore them. The time it takes for animals to habituate can generally be lengthened by using devices which are periodic, random or animal activated. As with other methods, these techniques tend to be more effective when used as part of an integrated management program.

Physical Human and Vehicle Harassment or Hazing: Physical human harassment or hazing involves people pursuing animals on foot, clapping their hands, or shouting. Vehicle harassment involves people pursuing animals with remote control vehicles including unmanned aerial vehicles (UAV or drones), or with non-motorized or motorized boats or other vehicles. These techniques can be used in conjunction with other methods to disperse animals from areas where they cause damage or threats.

Acoustic Stimuli: This category includes using a variety of noise making devices including but not limited to car horns, air horns, stereo systems, radios, bioacoustics (i.e., alarm or distress calls), sonic and ultrasonic devices, propane exploders, pyrotechnics, etc. The effectiveness of noise is generally limited because animals become accustomed to and learn to ignore them. It must be noted that sound-scare devices can also scare people, livestock, pets or non-target wildlife when they are used in their vicinity.

Visual Stimuli: Different types of lights (e.g., floodlights, strobe lights, lasers, revolving lighting units), scarecrows or effigies, moving (e.g., flags, windsocks, kites, UAS) and ultra violet or reflective material (e.g., Mylar® tape, mirrors), and other threatening images (some animals have a fear of new objects) have been used with mixed results. In general, the type of stimuli, the number of devices, and their location are determined by the size of the area to be protected and by the power sources available. However, most

animals rapidly become accustomed to such stimuli and they are not generally effective in the long-term. Devices activated by motion, body heat or radar may delay habituation.

Other Stimuli: Repellants are substances used to discourage or disrupt particular behavior and are effective because they are irritating, cause sickness or stimulate fear. Some examples include but are not limited to the following: undesirable tactile substances used to deter birds from perching (e.g., polyethylene sheeting); devices which deliver a mild electric shock when birds perch on them (e.g., Bird-shock™); and devices which don't allow birds to perch without being repeatedly touched by constantly moving parts (e.g., Daddi Long Legs™). Citronella, cumin oil, garlic oil, silica-based compounds and other similar substances have been used in an effort to deter birds from consuming grain, perching, loafing, roosting or nesting. These and other similar substances are non-restricted substances available for use by the public. Unfortunately, for many species of birds there are no known deterrents that are effective after repeated exposure (See also **Repellants**).

Devices Using Multiple Stimuli: One device which uses multiple stimuli is called the electronic guard. It is a frightening device composed of a blinking strobe and a siren which are activated by a timer. When operational, the device randomly flashes and omits sound for a few seconds at several minute intervals (USDA 2002). The device was designed specifically to reduce predation on livestock (Linhart 1984, Linhart et al. 1984, Linhart et al. 1992) but can be used in other applications. Another device consists of an illuminated pop-up scarecrow and a CD player with audio tracks likely to elicit fear (e.g., aggressively barking dogs, shotgun barrages) and designed to turn on when activated by the target animal. A similar device, the movement-activated guard, uses a strobe light and recorded sound effects to disperse animals when activated by movement (Shivik et al. 2003). Technology utilizing UAVs which carry effigies and broadcast distress calls (Wang et al. 2019), or even more advanced systems which use wireless ground sensors to deploy swarms of UAVs that emit both acoustic stimuli and repellents to the real time locations of birds causing damage, may be available in the future (Ampatzidis et al. 2015). These and similar devices can be activated by motion, body-heat, radar or other means.

Projectiles: Different types of projectiles (e.g., water from a hose or sprinkler, sticks, small rocks, etc.) may be used to frighten animals. Sprinklers activated by motion are also available. These techniques can be used in conjunction with other methods to disperse animals from areas where they cause damage or threats.

Paintball Markers: Paintball markers (or guns) work by using compressed carbon dioxide to propel projectiles. This method can be used in conjunction with other methods to disperse animals from areas where they cause damage or threats.

Paintballs: Paintballs are spherical capsules which are made of gelatin and contain a non-toxic glycol and water-based coloring. Paintballs are considered non-toxic and do not pose an environmental hazard as described in Safety Data Sheets. However, consumption may cause toxicosis in dogs, which is potentially fatal without supportive veterinary treatment (Donaldson 2003). Little is known about the mechanism of action and lethal dose for dogs that consume paintballs, but it is suspected that there is an osmotic diuretic effect resulting in an abnormal electrolyte and fluid balance (Donaldson 2003). With treatment, most affected dogs recover within 24 hours (Donaldson 2003).

Guard Animals: This method involves pasturing dogs or other animals with livestock for the purpose of reducing damage or threats from predatory birds. In general, the effectiveness of the method is dependent upon the individual guard animal, the individual predator and the number of livestock being guarded.

Animal Harassment or Hazing: The use of a species' natural predator or competitor to disperse animals from areas where they cause damage or threats.

Dogs: This method involves allowing dogs to pursue birds. Dogs trained and used for this purpose must stay with their handler to be effective. Properly trained and disciplined dogs should not make contact with target animals and have minimal effect on non-target animals.

Falconry: Trained raptors can be used to harass birds from areas where they are causing damage or threats. Raptors should not make contact with target birds. The VDWR allows persons meeting specific qualifications to use raptors for this purpose with a special permit (4VAC 15-250-10, 4VAC 15-250-20).

CAPTURE WITH LIVE CAPTURE DEVICES

Birds can be live captured by several methods listed and described in detail below. Upon capture, animals could be relocated or euthanized. Relocation may be appropriate in some situations. However, in most situations animals captured in live traps are subsequently euthanized (see **Lethal Methods**). For discussion of why animals are not generally relocated see Section 3.2. Wild birds are managed by the USFWS and/or the VDWR and translocation of them could only occur under their authority. WS would use capture devices in compliance with applicable federal, state and local laws and regulations (WS Directive 2.210) as well as WS Directives to reduce risks to persons and non-target animals. Birds would be transported promptly in an appropriately sized sanitary container with adequate ventilation. Birds would then be released at a site away from where damage and threats are occurring with suitable habitat and with permission of the landowner or manager.

Prior to their release, birds may be banded with leg bands for identification purposes. Bird banding can only occur when a person with a demonstrated proficiency in banding has applied for and been granted a permit by the USGS. Bird banding permits require the use of specific bands issued by USGS for specific species and that permittees band birds "in accordance with the principles, spirit, and intent of the most recent revision of The Ornithological Council's Guidelines in the Use of Wild Birds in Research". These guidelines (Fair et al. 2010) provide guidance on the capture, handling, band attachment and release of birds. When appropriately sized leg bands are used banded birds should not adversely be affected (Fair et al. 2010).

Hand Capture: Hand capture involves persons using their hands to take hold of an animal.

Nets: Open-meshed material fashioned in a manner to trap, catch or ensnare.

Hand Nets: Hand nets are used to catch animals in confined areas. These nets resemble fishing dip nets with the exception that they are larger and have long handles. A variation of the hand net is a round throw-net with weights at the edges of the net, similar to that used for fishing.

Cannon / Rocket Nets: Cannon or rocket netting involves using explosive charges to deploy a net over a set area were birds are expected to congregate after the device is set. The launching of the net occurs too quickly for the animals to escape.

Net Gun: This technique fires a net from a device which is held by a person or mounted to mobile equipment (e.g., truck, all-terrain vehicle) (Sutphin et al. 2018) to capture the target animal.

Bow Nets: Bow nets, which are hinged and spring-loaded circular traps, are set over a food source or other attractant (see **Attractants** below) and generally triggered to close by an observer. When the trap is set it resembles a half moon. When closed, it is analogous to a dip net held tight to the ground. There are several modified versions. One modified version (Bartos trap) is elevated several inches above a perch and an attractant and is triggered to close when weight is applied to the perch. Another version, designed

to be mounted vertically, uses a square arm which is triggered to close when pressure is applied to a pan. In this case the arm closes against wire mesh instead of the ground.

Drop Nets: Drop nets are set above an area where the target birds are expected to congregate (e.g., at a food source) and triggered by an observer.

Drive Traps or Panel Nets: Drive traps or panel nets consist of lightweight portable panels, (e.g., supports stretched with netting), that are used to herd and surround flightless birds (or birds that prefer not to fly). These may be used in conjunction with corral traps.

Mist Nets: Mist nets, made of a very fine mesh, are hung vertically in a drape-like fashion. Birds become entangled when they fly into it. These nets are generally used for capturing birds entrapped in structures or for capturing birds for disease sampling. Mist nets are monitored closely to ensure that any captured birds can be promptly removed.

Dho Gaza Nets**:** Made of heavy mesh, Dho Gaza nets are hung vertically in a drape-like fashion. The net falls on the bird as the bird flies into it.

Corral Trap: Corral traps may be constructed from steel or wood supports stretched with fencing or netting. They are open at both the top and bottom. Birds enter through door(s) or a narrow entrance way. The entranceway is then blocked by an observer to prevent escape. Birds maybe herded into the trap (see ***Drive Traps or Panel Nets*** above) or alternatively, traps may be baited with food or other items attractive to the target species (see **ATTRACTANTS** below).

Cage Traps: These traps are usually fully enclosed. Traps are typically baited or contain other birds to serve as an attractant (see **ATTRACTANTS** below). Cage traps must be checked frequently to ensure that captured animals are not subjected to extreme environmental conditions. WS SOPs require that traps be checked frequently so any captured animals can be addressed in a timely manner. Careful placement of traps at locations likely to capture target animals and the use of appropriate attractants further increases the selectivity of this method. Non-target species are released during trap checks unless it is determined that the animal would not survive or that the animal cannot be released safely.

Triggered door traps: These traps have a door or doors which are triggered to close when weight is applied to a pan, treadle, or perch, when a line is tripped or by an observer (e.g., Swedish goshawk trap).

Passive door traps: These traps have entrances (e.g., funnels, swinging doors etc.) or a series of entrances that enable the birds to enter but not exit. The shape and or the configuration of the trap and entrance prevents the bird from exiting. Examples include but are not limited to nest-box traps, Australian crow traps, repeating sparrow traps, pigeon traps, and elevator sparrow traps.

Live-restraint Traps: Live-restraint traps must be monitored closely to ensure that captured animals are not subjected to extreme environmental conditions. WS SOPs require that traps be checked frequently so any captured animals can be addressed in a timely manner. Careful placement of traps at locations (e.g., on perches) likely to capture target animals and the use of appropriate attractants further increases the selectivity of this method. Non-target species are released during trap checks unless it is determined that the animal would not survive or that the animal cannot be released safely. These traps maybe used in conjunction with attractants (see **ATTRACTANTS** below).

Pole trap: There are two general designs of pole traps. First, padded-jaw pole traps are spring powered devices which grasp a bird by its foot when the triggering mechanism is stepped on and two padded curved bars close to hold it. Traps are available in different sizes for different sized birds and can be

equipped with tension setting devices which exclude non-target animals weighing less than the target bird. Second, Verbail-design traps are spring powered devices activated when the bird steps on a trigger. The movement of the trigger releases a spring which along with the movement of the bird pulls a loop with a sliding knot tight around a bird's leg. Both designs have mechanisms which allow the bird to rest on the ground after capture.

Entanglement: (e.g., Bal Chatri, noose mats, halo traps, phai trap). These traps use twine, wire or monofilament loops with a sliding knot attached to a stationary object (mat, wire mesh box, tree branch, etc.). Birds become entangled when loops are pulled closed by the movement of the bird landing on or walking across the surface with the loops.

Glue boards: These devices consist of a rigid piece of plastic, cardboard or similar material with the horizontal surface coated in an adhesive. They may be enclosed or open. Animals making contact with the adhesive are restrained. Careful placement of traps at locations likely to capture target animals and exclude non-target animals and the use of appropriate attractants increases the selectivity of this method. WS would only use glue boards to address European starlings and house sparrows. As with all live capture devices, traps would be checked frequently, and target animals would be subsequently euthanized (see **Lethal Methods**).

Attractants: Attractants are used to increase the efficacy of other methods by enticing an animal to investigate a particular location where capture methods are deployed. Attractants may be food items (e.g., seed, carrion) or other things (e.g., perches, nest boxes, recorded calls, decoy birds). Target birds captured in cage traps can be maintained as a social attractant (decoy birds) for other birds. WS would provide food, water, shade and perches for animals used in decoy traps in accordance with WS' Directives and SOPs. Live animals (e.g., rock pigeon, mice) can also be used as attractants for predatory birds (e.g., hawks). Animals used as attractants may be obtained by WS during other program damage management activities.

INACTIVE NEST DESTRUCTION: The destruction of inactive nests (nests without eggs or chicks present) is employed at a localized level to discourage nesting in areas experiencing damage or threats. Nest destruction involves manually removing nesting materials. Under the MBTA, inactive nests may not be collected or possessed but are not protected from destruction (USFWS 2018*a, b*). However, some inactive nests are legally protected by statutes other than the MBTA (e.g., Endangered Species Act, Bald and Golden Eagle Protection Act).

NON-LETHAL METHODS (CHEMICAL)

Repellents: Chemical repellents are non-lethal chemicals used to discourage or disrupt particular behaviors of wildlife. There are three main types of chemical repellents: olfactory, taste, and tactile. Effective and practical chemical repellents should be nonhazardous to wildlife; nontoxic to humans, animals and the environment; resistant to weathering; easily applied; reasonably priced; and capable of providing good repellent qualities. The reaction of different individual animals to a single chemical formulation varies and this variation in repellency may be different from one habitat to the next. Chemical repellents are strictly regulated, and suitable repellents are not available for many species or wildlife damage situations. A common concern regarding the use of chemicals is the risk to humans, non-target animals and the environment. Chemical repellents would only be used by WS in accordance with label directions, WS Directives and SOPs. These requirements include but are not limited to training in the application of the method, the use of appropriate personal protective equipment, the use of caution during application, proper storage, and disposal. Under the FIFRA and its implementing guidelines, it is a violation of federal law to use any pesticide in a manner that is inconsistent with its label. When recommending these methods, WS would caution against their misuse.

Methyl Anthranilate: Methyl anthranilate is a compound which naturally occurs in plants. Approved by the FDA for human consumption, methyl anthranilate is commonly used as a "grape" flavoring agent (Brown et al. 2014). Registered for use as a bird repellant in the U.S. in 1985, it can be applied either directly to the resource being damaged (e.g., certain agricultural resources) or in areas in which the damage is occurring (e.g., non-fish bearing bodies of water, structures) (EPA 2016*a*, EPA 2016*b*, EPA 2017*a*). Application usually involves spraying or using a fog-producing machine which creates an aerosol (EPA 2016*a*, EPA 2016*b*). Methyl anthranilate acts as an irritant when the bird's trigeminal nerve (the nerve responsible for sensation in the face) contacts the compound (Avery 2002). Examples include but are not limited to products sold under the trade names Rejex-it® Migrate™, Avian Migrate™, Rejex-it® Fog Force™, Avian Fog Force™, Avian Control®, EcoBird® 4.0 and Bird Shield®. The EPA does not expect any adverse effects to humans, non-target animals or the environment from the use of methyl anthranilate when used according to label instructions because it is not toxic to animals or birds when ingested and there is little to no contact between animals and the active ingredient (EPA 2001).

Anthraquinone (9,10-Anthraquinone): Anthraquinone is a naturally occurring chemical. It can be found in animals, plants and bacteria which use it as a defense against predation, parasitism and herbivory (Linz and Homan 2012, Linz et al. 2014). First used as a bird repellant in the U.S. in the 1940's, anthraquinone is applied directly to the resource being damaged (e.g., seed corn) (Avery 2002, EPA 2017*b*). When ingested, anthraquinone causes discomfort and birds learn to avoid the area (Avery 2002). Examples include but are not limited to products sold under the trade names Airepel® HC and Avipel®. The EPA does not expect any adverse effects to humans, non-target animals or the environment from the use of anthraquinone when used according to label instructions because it is not toxic to animals or birds when ingested and there is little to no contact between animals and the active ingredient (EPA 2001).

Polybutene: Polybutene is contained in several tactile repellent products to deter birds from perching, loafing, roosting or nesting on structures (e.g., ledges) by creating a tacky or sticky surface that birds avoid. Examples include but are not limited to products sold under the trade names 4 the Birds®, Bird·B·Gone®, Bird Proof® and Hot Foot®. The EPA does not expect any adverse effects to humans, non-target animals or the environment from the use of polybutene when used according to label instructions because it is approved by the FDA as a food additive and exposure is limited to the treatment site (EPA 2014).

Mesurol *(EPA Reg. No. 056228-33)****:*** Mesurol is a repellant used to deter common ravens and common crows from consuming the eggs of threatened and endangered birds or eggs of other bird species in need of special protection (USDA 2009). It is administered by treating eggs from domestic birds similar in appearance to eggs of the species needing protection. Treated eggs are placed in in locations at or near where the species to be protected nest, prior to the onset of egg-laying by the species to be protected. The predatory birds consuming eggs treated with mesurol experience discomfort (e.g., regurgitation, lethargy) and develop an aversion to consuming similar looking eggs. Treatment sites are monitored for non-target use. If threatened or endangered species approach treated eggs, treated eggs would be removed in accordance with the label. Unconsumed eggs or unused eggs treated with mesurol must be retrieved and disposed of in accordance with the label and applicable Federal and State laws. It is unlikely that birds which consume treated eggs would pose a hazard to predators which may consume them because mesurol is metabolized relatively quickly after ingestion (EPA 1994). Mesurol would be used by WS in accordance with the label, WS' Directives and SOPs to minimize risks to human health and safety. Mesurol can only be handled by properly licensed, equipped and trained applicators. Only these individuals may be in treated areas which must be posted with warning signs and monitored. Mesurol is registered for use by WS only. However, in order for mesurol to be used in any given state, the product must also be registered with the state and approved for use by the appropriate state agency responsible for

managing wildlife. Mesurol is not currently registered for use in Virginia. However, if mesurol becomes available it could be used as a method in an integrated approach to managing damage.

Reproductive Inhibitors: Reproductive control for wildlife can be accomplished either through sterilization (permanent) or contraception (reversible). However, the use and effectiveness of reproductive control as a wildlife population management tool is limited by characteristics of the species (e.g., life expectancy, age at onset of reproduction, population size, etc.), environmental factors (e.g., isolation of target population, access to target individuals, etc.), socioeconomic, and other factors.

Currently, the only reproductive inhibitor that is registered with the EPA for use in any of the species addressed in this document is OvoControl® P (EPA Reg. No. 80224-1). OvoControl® P was officially registered by the EPA in 2005 for use in reducing the hatchability of rock dove, European starling, red-winged blackbird, boat-tailed grackle, Brewer's blackbird, common grackle, and brown-headed cowbird eggs in specific situations (EPA 2019*a*). It is applied by acclimating target birds to a feeding schedule of untreated bait (i.e., food). Once the target species has acclimated to the feeding schedule, birds are transitioned to OvoControl® P ready-to-use bait and fed daily throughout the entire breeding season. By acclimating target bird species to a feeding schedule, treatment can occur at specific times. OvoControl® P must be applied on rooftops or paved areas with limited access, areas must be monitored for non-target use, the product must be consumed within 15 minutes of application and unconsumed product removed (EPA 2019). This product would only be used by WS in accordance with label directions, WS Directives and SOPs. When recommending this method, WS would caution against its misuse.

Herbicides and Insecticides: In some cases, removing resources which attract birds to a location (see **Habitat Management**) by using chemical methods is appropriate. Herbicides (chemicals which kill plants) can be used alone or in conjunction with mechanical methods in an integrated approach to reduce the availability of vegetation used by birds for perching, loafing, roosting or nesting or which provide a food source (e.g., seed, fruit, etc.) (Washburn et al. 2011). Similarly, insecticides (pesticides which kill invertebrates) maybe used to reduce invertebrates which can attract large flocks of birds (Buckley and McCarthy 1994, Washburn et al. 2011). Both herbicides and insecticides are strictly regulated. A common concern regarding the use of chemicals is the risk to humans, non-target animals and the environment. These chemicals would only be used by WS in accordance with label directions, WS Directives and SOPs. These requirements include but are not limited to training in the application of the method, the use of appropriate personal protective equipment, the use of caution during application, proper storage, and disposal. Under the FIFRA and its implementing guidelines, it is a violation of federal law to use any pesticide in a manner that is inconsistent with its label. When recommending these methods, WS would caution against their misuse.

LETHAL METHODS (NON-CHEMICAL)

EGG AND ACTIVE NEST DESTRUCTION: The destruction of eggs and / or active nests (nests with eggs or chicks present) is employed at a localized level to inhibit nesting in areas experiencing damage or threats. Nest destruction involves manually removing nesting materials. Egg destruction can be accomplished through breaking, puncturing, shaking/addling, or oiling (see **Egg Oiling**). Puncturing involves inserting a long-pointed metal probe into the end of the egg. Shaking or addling involves shaking an egg vigorously until the embryo is rendered infertile. All egg destruction methods stop the embryo from developing. Whenever the presence of adult birds does not pose an immediate threat, eggs should be punctured, shaken /addled or oiled and placed back in the nest. Adult birds will return and continue to incubate the eggs beyond the expected hatch date, reducing or preventing the potential for re-nesting. Birds can identify areas with regular human disturbance and low reproductive success, relocating and nesting elsewhere when confronted with repeated nest failure. Although there may be reduced fecundity for the individual birds affected by egg and active nest destruction, this activity has no long-

term effect on breeding adult birds. Egg and active nest destruction can occur either without a permit if those bird species are not native, under migratory bird depredation permits issued by the USFWS, or under §29.1-529 of the Code of Virginia.

Hunting: Where appropriate, WS may recommend that those persons experiencing damage and threats associated with birds consider hunting at the damage site as an option for reducing damage. Lethal removal of some species of birds addressed in this EA can occur during hunting seasons. Hunting not only has the potential to remove individuals causing damage but also reinforces harassment programs as part of an integrated approach. Valid hunting licenses are required for the implementation of this method.

Shooting: Shooting is the practice of selectively removing target animals using firearms. Shooting, when deemed appropriate, can be highly effective in removing those individual animals responsible for causing damage and posing threats. It is selective for target species. It is also effective in supplementing harassment as part of an integrated approach. Animals removed by WS are killed as quickly and humanely as possible in accordance with WS Directive 2.505. WS' employment of this method may also involve the use of vehicles, elevated platforms, illuminating devices (e.g., spotlights, night vision, Forward Looking Infrared Devices (FLIR)), and suppressors. Lethal removal of those species addressed in this EA can occur without a permit if those bird species are not native, under migratory bird depredation permits issued by the USFWS, under 50 CFR 21.43 (blackbird depredation order), or under §29.1-529 of the Code of Virginia.

Snap Traps: Commonly known as mouse or rat traps, snap traps have a single jaw attached to a piece of wood or other stiff material. The trap is triggered to close when the treadle is disturbed. Careful placement of traps at locations likely to capture target animals and the use of appropriate attractants (see **ATTRACTANTS** above) further increases the selectivity of this method. WS would generally only use snap traps to address European starlings and house sparrows.

Live Capture Followed by Non-Chemical Euthanasia: Animals can be live captured by several methods listed and described in detail above (see **CAPTURE WITH LIVE CAPTURE DEVICES**). Upon capture, euthanasia could occur via shooting or cervical dislocation. WS would kill animals as quickly and humanely as possible in accordance with WS Directive 2.505.

Cervical Dislocation: This method is sometimes used to euthanize birds which are captured in live traps or hand captured. The animal is stretched, and the neck is hyper-extended and dorsally twisted to separate the first cervical vertebrae from the skull. The AVMA approves this technique as a humane method of euthanasia and states that cervical dislocation when properly executed is a humane technique for euthanasia of poultry (AVMA 2001). Cervical dislocation is a technique that may induce rapid unconsciousness, does not chemically contaminate tissue, and is rapidly accomplished (AVMA 2001).

LETHAL METHODS (CHEMICAL)

The use of chemical methods is strictly regulated by the DEA, EPA, FDA and VDACS.

All pesticides have to be registered with the EPA and must have labels approved by the agency which detail the product's ingredients, the type of pesticide, the formulation, classification, approved uses and formulations, potential hazards to humans, animals and the environment and directions for use. The registration process for pesticides is intended to assure minimal adverse effects to humans, animals and the environment when chemicals are used in accordance with label directions. Under the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) and its implementing guidelines, it is a violation of federal law to use any pesticide in a manner that is inconsistent with its label. Registered pesticides can only be applied by persons who have been specially trained and certified by the VDACS for their use.

These persons (certified applicators) are required to take continuing education classes and exams to maintain their certification. Each of the chemical methods listed below have specific requirements for their handling, transport, storage, application and disposal under the Code of Virginia and the Virginia Administrative Code.

All pesticides used by WS are registered as required by the FIFRA (administered by the EPA and the VDACS). WS personnel that use restricted-use chemicals are certified as pesticide applicators by the Commonwealth of Virginia and are required to adhere to all certification requirements set forth in FIFRA and Virginia pesticide control laws and regulations. Additionally, WS personnel that use restricted-use chemical methods would abide by all federal and state laws and regulations for their handling, transport, storage, application and disposal. Chemicals are only used on private, public, or tribal property sites with authorization from the property owner or manager.

Carbon Dioxide (CO_2): Although not a registered pesticide, carbon dioxide is a chemical method. Carbon dioxide is sometimes used to euthanize animals which are captured in live capture devices (see **Live Capture Devices** above) or captured by hand. Live animals are placed in a container or chamber which is then sealed. CO_2 gas is released into the chamber and the animals quickly die after inhaling the gas. This method is approved as a euthanizing agent by the AVMA (AVMA 2001). CO_2 gas is a byproduct of animal respiration, is common in the atmosphere, and is required by plants for photosynthesis. It is used to carbonate beverages for human consumption and is also the gas released by dry ice. The use of CO_2 by WS for euthanasia purposes is exceedingly minor and inconsequential to the amounts used for other purposes by society. Euthanasia conducted by WS would be done in accordance with WS Directive 2.505.

DRC-1339 and Starlicide (EPA Reg. No. 56228-29, 56228-63, and 61282-68): 3-chloro-p-toluide hydrochloride ($C_7H_9Cl_2N$) is a restricted use pesticide (EPA 2019*b*, EPA 2020*a*). DRC-1339 (EPA Reg. No. 56228-63) is registered for use in managing Brewer's blackbird, red-winged blackbird, common grackle, boat-tailed grackle, brown-headed cowbird, European starling, common raven, American crow, fish crow, rock pigeon, Eurasian collared dove, herring gull, great black-backed gull, ring-billed gull, and laughing gull at commercial animal operations, staging areas, gull colonies, gull feeding sites or gull loafing sites. DRC-1339 (EPA Reg. No. 56228-29) is registered for use in managing common raven, American crow and fish crow where these birds prey on livestock, threatened and endangered species or other species in need of special protection or where they cause damage to silage/fodder bags. Finally, Starlicide (EPA Reg. No. 61282-68) is registered for use in managing Brewer's blackbird, red-winged blackbird, common grackle, brown-headed cowbirds and European starlings at feedlots and poultry operations (EPA 2013b).

Target bird species are acclimated to a feeding schedule of untreated bait (i.e., food) selected and placed specifically to attract the species being targeted (i.e., pre-baiting). Once the target species has acclimated to the feeding schedule, the powdered pesticide is mixed with water or edible oil and the bait, allowed to dry, and applied. Bird species which ingest lethal doses of the treated bait die from nephrotoxicity (loss of kidney function) one to three days after ingestion (EPA 1995, Eisemann et al. 2003). DRC-1339 is registered for use by WS only and therefore would only be available under the proposed action alternative. Starlicide may be applied by anyone with the appropriate registered pesticide applicator license.

WS would only use DRC-1339 on a given property in response to a request for assistance after the property owner or manger has signed a document agreeing to allow its use on property they own and/or manage. WS personnel who possess or use DRC-1339 would be trained and certified in accordance with the label and WS Directive 2.401. For a detailed discussion on the potential effects of the use of DRC-

1339 and Starlicide on non-target animals, human health and safety and the environment see **CHAPTER 3**.

DRC-1339 and Starlicide Primary Hazard Profile - The likelihood of impact is dependent on first encountering the pesticide and then inhaling, ingesting or making dermal contact with enough of the pesticide to be affected. Applicators are required to wear personal protective equipment (EPA 2013*b*, EPA 2019*b*, EPA 2020*a*). Only properly licensed, equipped and trained applicators may prepare or handle the pesticide. Unauthorized persons must be excluded from the site or application must occur in a way that contact with other persons will not occur. Potential treatment sites must be pre-baited and monitored for non-target use. If non-target species approach, the animals would be harassed, and the pre-bait removed in accordance with the label. By acclimating target bird species to a feeding schedule, baiting can occur at specific times to ensure bait is quickly consumed, making it unavailable to non-targets. Unconsumed or unused DRC-1339 or Starlicide must be removed and disposed of in accordance with the label and WS Directive 2.401. Acute lethal dose (LD_{50})[7] values for target species are generally lower than 6 mg/kg (Eisemann et al. 2003). Although it is very highly toxic to target bird species, it is moderately toxic to other species (Eisemann et al. 2003). For example, acute lethal doses for northern harriers, Cooper's hawks and red-tailed hawks are 100 to <500 times that of the most sensitive target species (LD_{50} <100 to 562 mg/kg) (Eisemann et al. 2003). Mammals are also less sensitive (e.g., rats LD_{50} 302–350 mg/kg) (EPA 1995). When ingested by birds, the pesticide is rapidly absorbed, converted into other metabolites and excreted (EPA 1995, Eisemann et al. 2003). Cunningham et al. (1979), found that less than 10% of the 3.16–100 mg/kg of Starlicide administered to European starlings was retained in the body 30 minutes after treatment. In birds, long-term sub toxic exposure results in reduced fertility and nestling survival (Eisemann et al. 2003). Although DRC-1339 and Starlicide is moderately toxic to fish and highly toxic to aquatic invertebrates (EPA 1995), following labeling requirements eliminates the risks to these species. These label requirements include application more than 50 feet from a body of water, as well as pre-baiting and observation to ensure the absence of non-targets and the rapid uptake of treated bait by the target bird species.

DRC-1339 and Starlicide Secondary Hazards – Secondary poisoning has not been observed except in crows eating gut contents of pigeons (Krebs 1974). During research studies, carcasses of birds which died from DRC-1339 were fed to raptors including northern harriers for up to 141 days with no symptoms of secondary poisoning observed (DeCino et al. 1966). Additionally, the pesticide is not highly toxic to canids (e.g., coyotes, foxes, dogs) (EPA 1995). This can be attributed to the pesticide's relatively low toxicity to non-target animals and the tendency of DRC-1339 or Starlicide to be almost completely metabolized by the target birds, leaving little residue to be ingested by scavengers (Cunningham et al. 1979). The likelihood of secondary poisoning is further reduced by the collection and disposal of the birds killed, in accordance with the label and WS Directives 2.401 and 2.515. This guidance includes restrictions on periods when application can occur to ensure staff will be available to search and collect carcasses from not only the site the pesticide was applied but also known or suspected roosting and loafing areas (with landowner permission) during successive days.

DRC-1339 and Starlicide Environmental Degradation – When used according to the label, the pesticide poses minimal environmental risk (EPA 1995). Requirements for the storage, transport and application of the pesticide eliminates the likelihood that non-targets would encounter it in the environment. DRC-1339/Starlicide is typically very unstable in the environment and degrades quickly when exposed to

[7] An LD50 is the dosage in milligrams of material per kilogram of body weight required to cause death in 50% of a test population of a species.

sunlight, heat and ultraviolet radiation (EPA 1995). DRC-1339 and Starlicide is also highly soluble in water, does not hydrolyze, and photodegrades quickly in water with a half-life estimated at 6.3 hours in summer, 9.2 hours in spring sunlight, and 41 hours during winter (EPA 1995). DRC-1339 and Starlicide binds tightly with soil and is considered to have low mobility (EPA 1995). The half-life of DRC-1339 and Starlicide in biologically active soil was estimated at 25 hours with the identified metabolites having a low toxicity (EPA 1995).

4-Aminopyridine or Avitrol® (EPA Reg. No. 11649-4, 11649-5, 11649-6, 11649-7, and 11649-8): 4-aminopyridine ($C_5H_6N_2$) is a restricted use pesticide registered for use in managing Brewer's blackbird, red-winged blackbird, common grackle, boat-tailed grackle, brown-headed cowbird, European starling, rock pigeon, and house sparrow on or around structures, feeding, nesting, loafing and roosting sites (EPA 2007*a*, EPA 2013*c*). Avitrol® is applied by acclimating the birds to a feeding schedule of untreated grain selected and placed specifically to attract the species being targeted (i.e., pre-baiting). Once the target species has acclimated to the feeding schedule, the untreated grain is diluted by mixing with the same type of grain treated with Avitrol® (supplied in ready-to-use form by the manufacturer). Birds which ingest Avitrol® emit distress calls and fly erratically, thereby frightening the remaining flock. Although it is registered as a chemical frightening agent and it is not the purpose of the pesticide, some birds that ingest the product die of within an hour of cardiac or respiratory arrest (Schafer et al. 1973, Johnson and Glahn 1994, Avitrol Corporation 2020).

WS would only use Avitrol® on a property in response to a request for assistance after the property owner or manger has signed a document agreeing to allow its use on property they own and/or manage. WS personnel who possess or use Avitrol® would be trained and certified in accordance with the label and WS Directive 2.401. For a detailed discussion on the potential effects of the use of Avitrol® on non-target animals, human health and safety and the environment see **CHAPTER 3**.

Avitrol® Primary Hazard Profile - The likelihood of impact is dependent on first encountering the pesticide and then ingesting enough of the pesticide to be affected. Applicators are required to wear personal protective equipment. Only properly licensed, equipped and trained applicators may prepare or handle the pesticide or be in treated areas. Potential treatment sites must be pre-baited and monitored for non-target use. If non-target species are observed eating the pre-bait, the pesticide cannot be applied. By acclimating target bird species to a feeding schedule, baiting can occur at specific times to ensure bait is quickly consumed, making it unavailable to non-targets. Unconsumed or unused Avitrol® must be removed and disposed of in accordance with the label and WS Directive 2.401. Acute lethal dose (LD_{50}) values for target species are low (e.g., 2.4 mg/kg) (EPA 2007*a*). When ingested by birds, the pesticide is rapidly metabolized (Schafer et. al. 1974). Avitrol® toxicity to other species is variable (Schafer et al. 1973). The reported LD_{50} for rats and dogs are 28.7 and 3.7 mg/kg body weight, respectively (EPA 2007*a*). In birds, long-term sub toxic exposure results in reduced appetite, body weight, and limb weakness (EPA 2007). While no data exists to address toxicity to fish and aquatic invertebrates, use patterns make it unlikely that sufficient amounts of Avitrol® would be available to have an impact (EPA 2007*a*).

Avitrol® Secondary Hazards – Studies with predator and scavenger species have shown minimal potential for secondary poisoning during field use (Schafer 1991). A laboratory study by Schafer et al. (1974) fed red-winged black birds contaminated with Avitrol® to rats, dogs, and raptors at several times the published LD_{50} for various periods of time (up to 45 days) with no adverse effects. This can be attributed to birds' rapid metabolization of Avitrol® (Schaefer et al. 1974). However, some hazards may occur to predatory species if unabsorbed or metabolized Avitrol® is present in the gastrointestinal tract of affected or dead birds consumed (Schafer 1981, Holler and Shafer 1982). The likelihood of secondary

poisoning is reduced by the collection and disposal of the birds killed, in accordance with the label and WS Directives 2.401 and 2.515.

Avitrol® Environmental Degradation – Because sparse environmental fate data exist, EPA prepared a risk description by applying quantitative methods to label information, use patterns, fate and ecotoxicity data and models (EPA 2007*b*). EPA (2007*b*) concluded that given Avitrol®'s use pattern, quantification of the hazard wound not add to quantifying the risk. Requirements for the storage, transport and application of the pesticide eliminates the likelihood that Avitrol® would be introduced into the environment.

Sodium Lauryl Sulfate: Although not a registered pesticide, sodium lauryl sulfate is a chemical method. A surfactant and wetting agent commonly used in soap products; sodium lauryl sulfate was exempted from requirements of the FIFRA by the EPA in 1996 (EPA 1996). A solution of sodium lauryl sulfate (Stephanol® WA-Extra PCK) and water is applied to European starlings and other blackbirds using a sprayer at a roost location when temperatures fall below 41ºF (USDA 2012). The sodium lauryl sulfate allows the water to penetrate the bird's feathers and birds die of hypothermia (USDA 2012). Sodium lauryl sulfate is a common component in shampoos and fruit juices (EPA 1993). The use of sodium lauryl sulfate for euthanasia would be minor and inconsequential to the amounts used for other purposes by society and should not pose any unreasonable risks or adverse effects to humans, non-target animals and the environment. Euthanasia conducted by WS would be done in accordance with WS Directive 2.505.

Egg Oiling: Egg oiling is a method of egg destruction (see also **Egg and Active Nest Destruction**). Application involves coating the entire surface of eggs with oil. The oil blocks the exchange of gases which prevents the embryos from continuing to develop. Only 100% corn oil can be used for this purpose because corn oil (as opposed to similar substances) is exempted from regulation by the EPA under the FIFRA (40 CFR 152.25(f)(1)) (USFWS 2014*b*, EPA 2015, EPA 2017*c*). To be most effective, the oil should be applied as soon as it is determined that the last egg has been laid. Like egg addling or puncturing, this method has an advantage over nest or egg destruction because the incubating birds generally continue to sit on the nest long after the expected hatch date and do not re-nest. Most used for waterfowl, this method can also be used for other species (Fernandez-Duque et al. 2019).

APPENDIX F: OTHER TARGET SPECIES FOR WHICH PROPOSED MAXIMUM ANNUAL LETHAL REMOVAL BY WS IS LESS THAN 1.0% OF THE VIRGINIA POPULATION

(*), OR WHEN STATE POPULATION ESTIMATES ARE UNAVAILABLE, LESS THAN 0.05% OF THE NORTH AMERICAN OR USA/CANADIAN POPULATION (†).

Species	Population estimate (birds)	Proposed maximum annual lethal removal by WS (birds, active nests)	Proposed maximum annual lethal removal of birds by WS as a percentage of the population estimate
red-necked grebe	45,000†‡	20, 0	0.04%
Eurasian collared-dove	8,700,000†§	20, 20	0.0002%
common nighthawk	22,000,000†§	20, 20	0.0000009%
chimney swift	320,000*§	100, 20	0.03%
black-bellied plover	362,700†#	50, 0	0.01%
American golden-plover	500,000†#	20, 0	0.004%
semipalmated plover	200,000†#	50, 0	0.02%
killdeer	2,000,000†#	500, 120	0.02%
ruddy turnstone	245,000†#	20, 0	0.008%
stilt sandpiper	1,244,000†#	20, 0	0.001%
dunlin	1,500,000†#	100, 0	0.006%
least sandpiper	700,000†#	50, 0	0.007%
pectoral sandpiper	1,600,000†#	20, 0	0.001%
Western sandpiper	3,500,000†#	20, 0	0.0005%
willet	250,000†#	50, 20	0.02%
common tern	2,636*Δ	20, 20	0.75%
royal tern	8,212*Δ	20, 20	0.24%
northern gannet	233,650†↓	20, 0	0.008%
brown pelican	6,492*Δ	50, 20	0.77%
great blue heron	15,618*Δ	150, 50	0.96%
white ibis	3,492*Δ	20, 20	0.6%
turkey vulture	52,000*§	1,000, 20	0.5%
Cooper's hawk↕	19,000*§	50, 20	0.26%
red-shouldered hawk↕	47,000*§	75, 20	0.15%
broad-winged hawk↕	26,000*§	20, 20	0.07%
rough-legged hawk↕	300,000†§	20, 20	0.006%
barn owl↕	130,000†§	50, 20	0.03%
eastern screech-owl↕	45,000*§	20, 20	0.04%
great horned owl↕	14,000*§	50, 20	0.35%
barred owl↕	60,000*§	50, 20	0.08%
belted kingfisher	16,000*§	20, 20	0.12%
red-bellied woodpecker	450,000*§	20, 20	0.04%
yellow-bellied sapsucker	14,000,000†§	20, 20	0.0001%
downy woodpecker	410,000*§	20, 20	0.004%
hairy woodpecker	57,000*§	20, 20	0.03%
northern flicker	75,000*§	20, 20	0.02%
pileated woodpecker	74,000*§	20, 20	0.02%
merlin	1,600,000†§	20, 0	0.001%
eastern kingbird	210,000*§	50, 20	0.02%
blue jay	370,000*§	50, 20	0.01%
purple martin	120,000*§	150, 20	0.12%

tree swallow	170,000*§	250, 20	0.14%
northern rough-winged swallow	120,000*§	50, 20	0.04%
bank swallow	7,900,000†§	20, 20	0.0002%
cliff swallow	88,000*§	50, 50	0.05%
cave swallow	2,800,000†§	50, 20	0.001%
barn swallow	890,000*§	1,000, 250	0.11%
eastern bluebird	910,000*§	100, 20	0.01%
American robin	2,400,000*§	1,000, 100	0.04%
northern mockingbird	620,000*§	150, 50	0.02%
cedar waxwing	630,000*§	250, 20	0.03%
house sparrow	310,000*§	1,000, 500	0.32%
house finch	360,000*§	20, 20	0.005%
American goldfinch	1,100,000*§	100, 20	0.009%
lapland longspur	68,000,000†§	20, 20	0.00002%
chipping sparrow	3,600,000*§	100, 20	0.002%
field sparrow	300,000*§	100, 20	0.03%
savannah sparrow	5,400*§	50, 20	0.92%
grasshopper sparrow	300,000*§	100, 20	0.03%
song sparrow	1,300,000*§	50, 20	0.00003%
dark-eyed junco	20,000*§	100, 20	0.50%
bobolink	10,000*§	50, 20	0.50%
eastern meadowlark	610,000*§	500, 20	0.08%
red-winged blackbird	670,000*§	2,500, 20	0.37%
Brewer's blackbird	23,000,000†§	20, 0	0.00008%
common grackle	1,600,000*§	1,000, 120	0.06%
yellow-rumped warbler	170,000,000†§	20, 20	0.00001%
northern cardinal	2,700,000*§	20, 20	0.0007%
indigo bunting	3,600,000*§	20, 20	0.0005%

‡ MANEM 2006
§ Partners in Flight Science Committee 2019
# Andres et al. 2012
Δ Watts et al. 2019
↓ Chardine et al. 2013
↕ These birds may also be trapped and relocated/translocated (see page 56).

APPENDIX G: SPECIES AND CRITICAL HABITAT LISTED BY THE U.S. FISH AND WILDLIFE SERVICE[1]

[1]List obtained from U.S. Fish and Wildlife Service, Virginia Field Office, Ecological Services on 15 May 2020.

[2]Eastern black rail was subsequently listed as Threatened in October 2020. There were no changes in the analysis based on the change from a proposed to a Threatened species.

Amphibians	**Status**
Shenandoah salamander *(Plethodon shenandoah)*	Endangered
Arachnids	
spruce-fir moss spider (*Microhexura montivaga*)	Endangered
Birds	
eastern black rail (*Laterallus jamaicensis spp. Jamaicensis*)[2]	Proposed threatened
piping plover *(Charadrius melodus)*	Threatened
red knot (*Calidris canutus rufa*)	Threatened
red-cockaded woodpecker (*Picoides borealis*)	Endangered
roseate tern (*Sterna dougallii dougallii*)	Endangered
Clams	
Appalachian monkeyface (pearlymussel) *(Quadrula sparsa)*	Endangered
Atlantic pigtoe (*Fusconaia masoni*)	Proposed Threatened
birdwing pearlymussel *(Lemiox rimosus)*	Endangered
cracking pearlymussel *(Hemistena lata)*	Endangered
Cumberland bean (pearlymussel) *(Villosa trabalis)*	Endangered
Cumberland monkeyface (pearlymussel) *(Quadrula intermedia)*	Endangered
Cumberlandian combshell *(Epioblasma brevidens)*	Endangered
dromedary pearlymussel *(Dromus dromas)*	Endangered
dwarf wedgemussel *(Alasmidonta heterodon)*	Endangered
fanshell *(Cyprogenia stegaria)*	Endangered
finerayed pigtoe *(Fusconaia cuneolus)*	Endangered
fluted kidneyshell *(Ptychobranchus subtentum)*	Endangered
green blossom (pearlymussel) *(Epioblasma torulosa gubernaculum)*	Endangered
James spinymussel *(Pleurobema collina)*	Endangered
littlewing pearlymussel *(Pegias fabula)*	Endangered
oyster mussel *(Epioblasma capsaeformis)*	Endangered
pink mucket (pearlymussel) *(Lampsilis abrupta)*	Endangered
purple bean *(Villosa perpurpurea)*	Endangered
rough pigtoe *(Pleurobema plenum)*	Endangered
rough rabbitsfoot *(Quadrula cylindrica strigillata)*	Endangered
sheepnose mussel *(Plethobasus cyphyus)*	Endangered
shiny pigtoe *(Fusconaia cor)*	Endangered
slabside pearlymussel *(Pleuronaia dolabelloides)*	Endangered
snuffbox mussel *(Epioblasma triquetra)*	Endangered
spectaclecase (mussel) *(Cumberlandia monodonta)*	Endangered
tan riffleshell *(Epioblasma florentina walkeri (=e. walkeri))*	Endangered
yellow lance (*Elliptio lanceolate*)	Threatened
Crustaceans	
big sandy crayfish *(Cambarus callainus)*	Threatened
Lee County cave isopod *(Lirceus usdagalun)*	Endangered
Madison Cave isopod *(Antrolana lira)*	Threatened
Fishes	
blackside dace *(Phoxinus cumberlandensis)*	Threatened
candy darter (*Etheostoma osburni*)	Endangered
duskytail darter *(Etheostoma percnurum)*	Endangered

Roanoke logperch *(Percina rex)*	Endangered
slender chub *(Erimystax cahni)*	Threatened
spotfin chub *(Erimonax monachus)*	Threatened
yellowfin madtom *(Noturus flavipinnis)*	Threatened
yellowfin madtom *(Noturus flavipinnis)* Population: Holston River, VA, TN	Experimental Population, Non-Essential
Flowering plants	
eastern prairie fringed orchid *(Platanthera leucophaea)*	Threatened
harperella *(Ptilimnium nodosum)*	Endangered
Michaux's sumac *(Rhus michauxii)*	Endangered
Northeastern bulrush *(Scirpus ancistrochaetus)*	Endangered
Peter's Mountain mallow *(Iliamna corei)*	Endangered
Roan Mountain bluet *(Hedyotis purpurea var. montana)*	Endangered
seabeach amaranth *(Amaranthus pumilus)*	Threatened
sensitive joint-vetch *(Aeschynomene virginica)*	Threatened
shale barren rock cress *(Arabis serotina)*	Endangered
small whorled pogonia *(Isotria medeoloides)*	Threatened
small-anthered bittercress *(Cardamine micranthera)*	Endangered
smooth coneflower *(Echinacea laevigata)*	Endangered
swamp pink *(Helonias bullata)*	Threatened
Virginia round-leaf birch *(Betula uber)*	Threatened
Virginia sneezeweed *(Helenium virginicum)*	Threatened
Virginia spiraea *(Spiraea virginiana)*	Threatened
Insects	
Mitchell's satyr butterfly *(Neonympha mitchellii mitchellii)*	Endangered
Northeastern beach tiger beetle *(Cicindela dorsalis dorsalis)*	Threatened
rusty patched bumble bee (*Bombus affinis*)	Endangered
Lichens	
rock gnome lichen *(Gymnoderma lineare)*	Endangered
Mammals	
Carolina northern flying squirrel *(Glaucomys sabrinus coloratus)*	Endangered
gray bat *(Myotis grisescens)*	Endangered
Indiana bat *(Myotis sodalis)*	Endangered
northern long-eared bat *(Myotis septentrionalis)*	Threatened
Virginia big-eared bat *(Corynorhinus (=plecotus) townsendii virginianus)*	Endangered
Reptiles	
green sea turtle *(Chelonia mydas)*	Threatened
Hawksbill sea turtle *(Eretmochelys imbricata)*	Endangered
Kemp's ridley sea turtle *(Lepidochelys kempii)*	Endangered
leatherback sea turtle *(Dermochelys coriacea)*	Endangered
loggerhead sea turtle *(Caretta caretta)*	Threatened
Snails	
Virginia fringed mountain snail *(Polygyriscus virginianus)*	Endangered

Critical habitat which lie fully or partially within the Commonwealth of Virginia

Clams	Critical Habitat Type
Atlantic pigtoe (*Fusconaia masoni*)	Proposed
Cumberlandian combshell *(Epioblasma brevidens)*	Final designated
fluted kidneyshell *(Ptychobranchus subtentum)*	Final designated
oyster mussel *(Epioblasma capsaeformis)*	Final designated
purple bean *(Villosa perpurpurea)*	Final designated
rough rabbitsfoot *(Quadrula cylindrica strigillata)*	Final designated
slabside pearlymussel *(Pleuronaia dolabelloides)*	Final designated
yellow lance (*Elliptio lanceolate*)	Proposed
Crustaceans	
big sandy crayfish (*Cambarus callainus*)	Proposed
guyandotte river crayfish (*Cambarus veteranus*)	Proposed
Fishes	
candy darter (*Etheostoma osburni*)	Proposed
slender chub *(Erimystax cahni)*	Final designated
spotfin chub *(Erimonax monachus)*	Final designated
yellowfin madtom *(Noturus flavipinnis)*	Final designated
Mammals	
Indiana bat (*Myotis sodalis*)	Final designated

APPENDIX H: SPECIES LISTED BY THE COMMONWEALTH OF VIRGINIA[1]

[1]List obtained from <https://www.dgif.virginia.gov/wp-content/uploads/media/virginia-threatened-endangered-species.pdf>. On 11 June 2020, The Virginia Administrative Code 2 VAC 5-320-10, the Code of Virginia §3.2-1007 and §3.2-1009.

Common Name	Scientific Name	Status
Freshwater fishes		
Atlantic sturgeon	*Acipenser oxyrinchus*	E
blackbanded sunfish	*Enneacanthus chaetodon*	E
blackside dace	*Chrosomus cumberlandensis*	T
candy darter	*Etheostoma osburni*	E
Carolina darter	*Etheostoma collis*	T
duskytail darter	*Etheostoma percnurum*	E
emerald shiner	*Notropis atherinoides*	T
golden darter	*Etheostoma denoncourti*	T
greenfin darter	*Etheostoma chlorobranchium*	T
orangefin madtom	*Noturus gilberti*	T
Paddlefish	*Polyodon spathula*	T
Roanoke logperch	*Percina rex*	E
sharphead darter	*Etheostoma acuticeps*	E
shortnose sturgeon	*Acipenser brevirostrum*	E
sickle darter	*Percina williamsi*	T
slender chub	*Erimystax cahni*	T
spotfin chub	*Erimonax monachus*	T
steelcolor shiner	*Cyprinella whipplei*	T
Tennessee dace	*Chrosomus (=Phoxinus) tennesseensis*	E
variegate darter	*Etheostoma variatum*	E
western sand darter	*Ammocrypta clara*	T
whitemouth shiner	*Notropis alborus*	T
yellowfin madtom	*Noturus flavipinnis*	T
Amphibians		
barking treefrog	*Hyla gratiosa*	T
eastern tiger salamander	*Ambystoma tigrinum*	E
Mabee's salamander	*Ambystoma mabeei*	T
Shenandoah salamander	*Plethodon shenandoah*	E
Reptiles		
bog (=Muhlenberg) turtle	*Glyptemys (=Clemmys)muhlenbergii*	E

Canebrake rattlesnake	*Crotalus horridus (coastal plain population)*	E
eastern chicken turtle	*Deirochelys reticularia reticularia*	E
eastern glass lizard	*Ophisaurus ventralis*	T
green sea turtle	*Chelonia mydas*	T
hawksbill sea turtle	*Eretmochelys imbricata*	E
Kemp's ridley sea turtle	*turtle Lepidochelys kempii*	E
leatherback sea turtle	*Dermochelys coriacea*	E
loggerhead sea turtle	*Caretta caretta*	T
wood turtle	*Glyptemys insculpta*	T
Birds		
Bachman's sparrow	*Aimophila aestivalis*	T
Bachman's warbler (=wood)	*Vermivora bachmanii*	E
Bewick's wren	*Thryomanes bewickii*	E
eastern black rail	*Laterallus jamaicensis jamaicensis*	E
gull-billed tern	*Sterna nilotica*	T
Henslow's sparrow	*Ammodramus henslowii*	T
Kirtland's warbler	*Setophaga kirtlandii (=Dendroica kirtlandii)*	E
loggerhead shrike	*Lanius ludovicianus*	T
peregrine falcon	*Falco peregrinus*	T
piping plover	*Charadrius melodus*	T
red knot	*Calidris canutus rufa*	T
red-cockaded woodpecker	*Picoides borealis*	E
roseate tern	*Sterna dougallii dougallii*	E
Wilson's plover	*Charadrius wilsonia*	E
Mammals		
American water shrew	*Sorex palustris*	E
Carolina northern flying squirrel	*Glaucomys sabrinus coloratus*	E
eastern puma (=cougar)	*Puma (=Felis) concolor couguar*	E
gray bat	*Myotis grisescens*	E
gray wolf	*Canis lupus*	E
Indiana bat	*Myotis sodalis*	E
little brown bat	*Myotis lucifugus*	E
northern long-eared bat	*Myotis septentrionalis*	T
Rafinesque's eastern big-eared bat	*Corynorhinus rafinesquii macrotis*	E
rock vole	*Microtus chrotorrhinus*	E

snowshoe hare	*Lepus americanus*	E
tri-colored bat	*Perimyotis subflavus*	E
Virginia big-eared bat	*Corynorhinus (=Plecotus)townsendii virginianus*	E
Mollusks		
Appalachian monkeyface (pearlymussel)	*Quadrula sparsa*	E
Atlantic pigtoe	*Fusconaia masoni*	T
birdwing pearlymussel	*Lemiox rimosus*	E
black sandshell	*Ligumia recta*	T
brook floater	*Alasmidonta varicosa*	E
cracking pearlymussel	*Hemistena lata*	E
Cumberland bean (pearlymussel)	*Villosa trabalis*	E
Cumberland monkeyface (pearlymussel)	*Quadrula intermedia*	E
Cumberlandian combshell	*Epioblasma brevidens*	E
deertoe	*Truncilla truncata*	E
dromedary pearlymussel	*Dromus dromas*	E
dwarf wedgemussel	*Alasmidonta heterodon*	E
elephantear	*Elliptio crassidens*	E
fanshell	*Cyprogenia stegaria*	E
finerayed pigtoe	*Fusconaia cuneolus*	E
fluted kidneyshell	*Ptychobranchus subtentum*	E
fragile papershell	*Leptodea fragilis*	T
green blossom (parlymussel)	*Epioblasma torulosa gubernaculum*	E
green floater	*Lasmigona subviridis*	T
James spinymussel	*Pleurobema collina*	E
littlewing pearlymussel	*Pegias fabula*	E
Ohio pigtoe	*Pleurobema cordatum*	E
oyster mussel	*Epioblasma capsaeformis*	E
pimpleback Quadrula	*pustulosa pustulosa*	T
pink mucket (pearlymussel)	*Lampsilis abrupta*	E
pistolgrip	*Tritogonia verrucosa*	T
purple bean	*Villosa perpurpurea*	E
purple lilliput	*Toxolasma lividus*	E
pyramid pigtoe	*Pleurobema rubrum*	E
rayed bean	*Villosa fabalis*	E

rough pigtoe	*Pleurobema plenum*	E
rough rabbitsfoot	*Quadrula cylindrica*	E
sheepnose	*Plethobasus cyphyus*	E
shiny pigtoe	*Fusconaia cor*	E
slabside pearlymussel	*Lexingtonia dolabelloides*	E
slippershell mussel	*Alasmidonta viridis*	E
snuffbox mussel	*Epioblasma triquetra*	E
spectaclecase	*Cumberlandia monodonta*	E
tan riffleshell	*Epioblasma florentina walkeri (=E. walkeri)*	E
Tennessee heelsplitter	*Lasmigona holstonia*	E
yellow lance	*Elliptio lanceolata*	T
Appalachian springsnail Fontigens bottimeri	*Fontigens bottimeri*	E
brown supercoil Paravitrea septadens	*Paravitrea septadens*	T
rubble coil Helicodiscus lirellus	*Helicodiscus lirellus*	E
shaggy coil Helicodiscus diadema	*Helicodiscus diadema*	E
spider elimia Elimia arachnoidea	*Elimia arachnoidea*	E
spiny riversnail Io fluvialis	*Io fluvialis*	T
spirit supercoil Paravitrea hera	*Paravitrea hera*	E
thankless ghostsnail Holsingeria unthanksensis	*Holsingeria unthanksensis*	E
Virginia fringed mountain snail Polygyriscus virginianus	*Polygyriscus virginianus*	E
Virginia springsnail Fontigens morrisoni	*Fontigens morrisoni*	E
Freshwater crustaceans		
big sandy crayfish Cambarus callainus (formerly C. veteranus)	*Cambarus callainus (formerly C. veteranus)*	T
Lee County Cave isopod	*Lirceus sdagalun*	E
Madison Cave amphipod	*Stygobromus stegerorum*	T
Madison Cave isopod	*Antrolana lira*	T
Millipedes		
Ellett Valley pseudotremia	*Pseudotremia cavemarum*	T
Laurel Creek xystodesmid	*Sigmoria whiteheadi*	T
Arachnids		
spruce-fir moss spider	*Microhexura montivaga*	E
Insects		

Appalachian grizzled skipper	*Nicrophorus americanus*	T
Buffalo Mountain mealybug	*Pyrgus wyandot (=Pyrgus centaureae wyandot)*	E
Holsinger's cave beetle	*Puto kosztarabi*	E
Mitchell's satyr butterfly	*Pseudanophthalmus holsingeri*	E
northeastern beach tiger beetle	*Neonympha mitchellii*	T
Thomas' cave beetle	*Pseudanophthalmus thomasi*	E
Virginia Piedmont water boatman	*Sigara depressa*	E
Marine mammals		
blue whale	*Balaenoptera musculus*	E
finback whale	*Balaenoptera physalus*	E
humpback whale	*Megaptera novaeangliae*	E
North Atlantic right whale	*Eubalaena glacialis*	E
sei whale	*Balaenoptera borealis*	E
sperm whale	*Physeter catodon (=microcephalus)*	E
West Indian manatee	*Trichechus manatus*	E
Plants		
valley doll's-daisy	*Boltonia montana*	E
small-anthered bittercress	*Cardamine micranthera*	E
juniper sedge	*Carex juniperorum*	E
Bentley's coralroot	*Corallorhiza bently*	E
Harper's fimbristylis	*Fimbristylis perpusilla*	E
Virginia sneezeweed	*Helenium virginicum*	E
swamp-pink	*Helonias bullata*	E
long-stalked holly	*Ilex collina*	E
Peter's Mountain mallow	*Iliamna corei*	E
Virginia quillwort	*Isoetes virginica*	E
small whorled pogonia	*Isotria medeoloides*	E
harperella	*Ptilimnium nodosum*	E
northeastern bulrush	*Scirpus ancistrochaetus*	E
Virginia spiraea	*Spiraea virginiana*	E
running glade clover	*Trifolium calcaricum*	E
sensitive-joint vetch	*Aeschynomene virginica*	T
seabeach amaranth	*Amaranthus pumilus*	T
shale barren rockcress	*Arabis serotina*	T
Millboro leatherflower	*Clematis viticaulis*	T

smooth coneflower	*Echinaace laevigata*	T
New Jersey rush	*Juncus Caesariensis*	T
northern prostrate clubmoss	*Lycopodiella margueritiae*	T
narrow-leaved spatterdock	*Nuphar sagittifolia*	T
eastern prairie fringed orchid	*Platanthera leucophaea*	T
Michaux's sumac	*Rhus michauxii*	T
reclining bulrush	*Scirpus flaccidifolius*	T
Virginia birch / round-leaf birch	*Betula uber*	E
Wild ginseng	*Panax quinquefolius L.*	T