ENVIRONMENTAL ASSESSMENT

REDUCING BIRD DAMAGE

IN THE STATE OF VERMONT

In cooperation with:

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

Prepared by:

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

November 2015

TABLE OF CONTENTS

LIST OF APPENDICES

ACRONYMS

APHIS	Animal and Plant Health Inspection Service
AQDO	Aquaculture Depredation Order
AVMA	American Veterinary Medical Association
BBS	Breeding Bird Survey
BDM	Bird Damage Management
CBC	Christmas Bird Count
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CSA	Cooperative Service Agreement
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FDA	Food and Drug Administration
FEIS	Final Environmental Impact Statement
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FONSI	Finding of No Significant Impact
FR	Federal Register
FY	Fiscal Year
IWDM	Integrated Wildlife Damage Management
LGLSP	Lower Great Lakes/St. Lawrence Plain
MA	Methyl Anthranilate
MANEM	Mid-Atlantic / New England / Maritimes
MBTA	Migratory Bird Treaty Act
MOU	Memorandum of Understanding
NAS	National Audubon Society
NASS	National Agricultural Statistics Service
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NWRC	National Wildlife Research Center
PIF	Partners in Flight
PRDO	Public Resource Depredation Order
ROD	Record of Decision
SOP	Standard Operating Procedure
T&E	Threatened and Endangered
USC	United States Code
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
VAAFM	Vermont Agency of Agriculture, Food & Markets
VFWD	Vermont Fish and Wildlife Department
VDH	Vermont Department of Health
VOGA	Vermont Outdoor Guide Association
WS	Wildlife Services

CHAPTER 1: PURPOSE AND NEED FOR ACTION

1.1 INTRODUCTION

Across the United States, wildlife habitat has been substantially changed as human populations expand and land is used for human needs. These human uses and needs often compete with the needs of wildlife which increases the potential for conflicting human/wildlife interactions. This Environmental Assessment (EA) evaluates the potential environmental effects of alternatives for WS involvement in bird damage management (BDM) in Vermont.

Wildlife damage management (WDM) is the science of reducing damage or other problems associated with wildlife, and is recognized as an integral part of wildlife management (The Wildlife Society 2010). 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 (46 Stat. 1468; 7 U.S.C. 426-426b) as amended, and the Act of December 22, 1987 (101 Stat. 1329-331, 7 U.S.C. 426c)). Human/wildlife conflict issues are complicated by the wide range of public responses to wildlife and wildlife damage. What may be unacceptable damage to one person may be a normal cost of living with nature to someone else. An individual person will have a unique definition of damage. However, the use of the term *"damage"* will consistently be used to describe situations where the individual person has determined the losses associated with wildlife is actual damage requiring assistance (i.e., has reached an individual threshold).

WS' activities are conducted to prevent or reduce wildlife damage to agricultural, industrial and natural resources, property, livestock, 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 wildlife damage management (IWDM) approach (WS Directive 2.105[1]) in which a combination of methods may be used or recommended to reduce wildlife damage. These methods may include non-lethal techniques like alteration of cultural practices, habitat management, repellents, frightening devices, and physical exclusion to prevent or reduce damage. The reduction of wildlife damage may also require removal of individual animals, reducing the local animal populations through lethal means. In some instances, the goal may be to eradicate an invasive species. Program activities are not based on punishing offending animals but are conducted to reduce damage and risks to human and livestock health and safety, and are used as part of the WS Decision Model (Slate et al. 1992).

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

WS chose to prepare this EA to facilitate planning, interagency coordination and the streamlining of program management, and to clearly communicate with the public the analysis of individual 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.

[1]The WS Policy Manual (http://www.aphis.usda.gov/wildlifedamage) provides guidance for WS personnel to conduct wildlife damage management activities through Program Directives. WS Directives referenced in this EA can be found in the manual but will not be referenced in the Literature Cited Appendix.

1.2 PURPOSE

The purpose of this EA is to evaluate cumulatively the individual projects conducted by WS and the U.S. Fish and Wildlife Service (USFWS) in Vermont to manage damage and threats to agricultural resources, property, natural resources, and threats to humans associated with the bird species listed in Appendix C.

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 goals of WS and the USFWS are to conduct a coordinated program in accordance with plans and objectives developed to reduce damage, and because those goals and 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 Vermont as part of a coordinated program.

This EA will evaluate the need for action to manage damage associated with birds in the state, the potential issues associated with bird damage management, and the environmental consequences of conducting different alternatives to address the need for action and the identified issues. The USFWS, the Vermont Fish and Wildlife Department (VFWD), the Vermont Agency of Agriculture, Food & Markets (VAAFM), and the Vermont Department of Health (VDH) will be consulted on the development of this EA when applicable. To assist with the identification of additional issues and alternatives to managing damage associated with birds in Vermont; this EA will be made available to the public for review and comment prior to the issuance of a Decision[2].

WS and the USFWS previously developed an EA that addressed WS' activities to manage damage associated with birds and two supplements to the EA that addressed WS' activities to manage damage caused by ring-billed gulls and double-crested cormorants (USDA 2004; USDA 2007; USDA 2010). Based on the analyses in the EA and both supplements, a Decision and Finding of No Significant Impact (FONSI) was signed selecting the proposed action alternative for the EA and both supplements. The proposed action alternative in the EA and both supplements implemented a damage management program using a variety of methods in an integrated approach (USDA 2004; USDA 2007; USDA 2010). Changes in the need for action and the affected environment have prompted WS and the USFWS to initiate this new analysis to address comprehensive bird damage. 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 and a need to address damage and threats of damage associated with several additional species of birds.

1.3 NEED FOR ACTION

Some species of wildlife have adapted to and have thrived in human altered habitats. Those species, in particular, are often responsible for the majority of conflicts between humans and wildlife that lead to requests for assistance to reduce damage to resources and to reduce threats to human safety.

Both sociological and biological carrying capacities must be applied when resolving wildlife damage problems. The wildlife acceptance capacity, or cultural carrying capacity, is the limit of human tolerance for wildlife or the maximum number of a given species that can coexist compatibly with local human populations. Biological carrying capacity is the land or habitat's ability to support healthy populations of

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

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

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

Wildlife management is often based on balancing wildlife populations and human perceptions, in a struggle to preserve rare species, regulate species populations, oversee consumptive uses of wildlife, and conserve the environment that provides habitat for wildlife resources. Increasingly, cities, towns, parks, airports, and private properties have become sites of some of the greatest challenges for wildlife management (Adams et al. 2006). When the presence of a prolific, adaptable species is combined with human expansion, land management conflicts often develop. Birds are generally regarded as providing ecological, educational, economic, recreational, and aesthetic benefits (Decker and Goff 1987), and there is enjoyment in knowing wildlife exists and contributes to natural ecosystems (Decker and Goff 1987).

Birds add an aesthetic component to the environment, sometimes provide opportunities for recreational hunting, and like all wildlife, provide people with valued close contact with nature. Many people, even those people experiencing damage, consider those species of birds addressed in this EA to be a charismatic and valuable component of their environment; however, tolerance differs among individuals. Because of their prolific nature, site tenacity, longevity, size, and tolerance of human activity, many bird species are often associated with situations where damage or threats can occur. For example, free-ranging waterfowl are extremely adaptable and may use the resources provided by humans in urban landscapes for nesting, raising young, molting, feeding, and loafing.

Birds are difficult to manage because they are highly mobile, able to exploit a variety of habitat types within a given area, and cannot be permanently excluded from large areas. It is rarely desirable or possible to remove or disperse all problem birds from an area, but with a proper management scheme, the number of birds and associated problems may be reduced to a level that can be tolerated. Additionally, management of bird-related problems often exceeds the capabilities of individual people to reduce damage to tolerable levels. In Vermont, problem situations associated with birds typically involve, but are not limited to, unacceptable accumulations of feces in public-use areas, damage to agricultural and natural resources, disease concerns and unacceptable safety hazards (e.g., aircraft striking birds). Those

problems frequently occur on private properties, natural/habitat restoration sites, corporate and industrial sites, airports, in residential communities, apartment/condominium complexes, municipal parks, schools, hospitals, office complexes, roadways, and other areas.

The need for action to manage damage and threats associated with birds in Vermont arises from requests for assistance[3] received by WS and the USFWS to reduce and prevent damage associated with birds from occurring to four major categories (USDA 2004, USDA 2007, USDA 2010, USFWS 2003, USFWS 2009). Those four major categories include agricultural resources, natural resources, property, and threats to human safety. WS have identified those bird species most likely to be responsible for causing damage to those four categories based on previous requests for assistance and assessments of the threat of bird strike hazards at airports. Table 1.1 lists WS' technical assistance projects involving bird damage or threats of bird damage to those four major resource types in Vermont from the federal fiscal year[4] (FY) 2010 through FY 2014. Table 1.1 does not include projects where direct operational assistance was conducted by WS.

Technical assistance has been provided by WS to those persons requesting assistance with resolving damage or the threat of damage by providing information and recommendations on methods and techniques to reduce damage that can be conducted by the requestor without WS' direct involvement in managing or preventing the damage. WS' technical assistance activities will be discussed further in Chapter 3 of this EA. The technical assistance projects conducted by WS are representative of the damage and threats that are caused and could be caused by birds in Vermont. From FY 2010 through FY 2014, WS has conducted 750 technical assistance projects that addressed damage and threats of damage associated with those bird species addressed in this assessment. Some of the projects involved multiple resources and multiple species.

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

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

Table 1.1 – Technical assistance projects conducted by WS in Vermont, FY 2010 - FY 2014

Species	Projects	Species	Projects
American Crow	48	Herring Gull	8
American Robin	28	Hooded Merganser	1
Bald Eagle	2	House Finch	1
Barn Owl	6	House Wren	1
Barn Swallow	5	Laughing Gull	1
Barred Owl	17	Mallard	24
Blackbirds (mixed species)	10	Merlin	1
Blue Jay	7	Mockingbird	1
Bonaparte's Gull	1	Mourning Dove	4
Canada Geese	202	Northern Cardinal	2
Cedar Waxwing	3	Osprey	2
Common Grackle	2	Pea Fowl	1
Common Loon	4	Peregrine Falcon	1
Common Raven	8	Pileated Woodpecker	14
Cooper's Hawk	3	Purple Finch	2
Double-crested Cormorant	22	Red-tailed Hawk	20
Downy Woodpecker	4	Red-winged Blackbird	6
Eastern Kingbird	1	Ring-billed Gull	18
Eastern Screech Owl	2	Rose-breasted Grosbeak	1
English (house) Sparrow	17	Ruby-throated Hummingbird	1
European Starling	105	Ruffed Grouse	6
Field Sparrow	1	Sandhill Crane	1
Feral Chicken	4	Sharp-shinned Hawk	9
Feral Geese	1	Snowy Owl	5
Feral Pigeon	55	Tree Swallow	2
Gray Catbird	1	Turkey Vulture	3
Great Blue Heron	18	Wild Turkey	32
Hairy Woodpecker	3	Yellow-bellied Sapsucker	2
		TOTAL:	**750**

Table 1.2 lists the number of technical assistance projects involving bird damage or threats of bird damage by the four major resource types in Vermont from the federal fiscal year[5] (FY) 2010 through FY 2014. Many of the bird species addressed in this EA can cause damage to or pose threats to a variety of resources. Most requests for assistance received by WS are related to threats associated with those bird species at or near airports, around agricultural facilities and damage to property. Bird strikes can cause substantial damage to aircrafts which could require costly repairs. In some cases, bird strikes can lead to the catastrophic failure of the aircraft, which can threaten passenger safety. Many of the species addressed in this assessment are gregarious (i.e., form large flocks) species especially during the fall and spring migration periods. Although damage and threats can occur throughout the year, damage or the threat of damage is highest during those periods when birds are concentrated into large flocks such as migration periods and during winter months when food sources are limited. For some bird species, high concentrations of birds can be found during the breeding season where suitable nesting habitat exists. The flocking behavior of many bird species during migration periods can pose increased risks when those species occur near or on airport properties. An aircraft striking multiple birds not only can increase the

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

damage to the aircraft but also increases the risk that a catastrophic failure of the aircraft might occur, especially if multiple birds are ingested into aircraft engines.

Table 1.2 – The Number of bird species incidents addressed by WS in Vermont from FY 2010 through FY 2014 by the resource type damaged

Species	Resource*				Species	Resource*			
	A	H	N	P		A	H	N	P
American Crow	5	31	1	11	Herring Gull	0	4	1	3
American Robin	0	26	0	2	Hooded Merganser	1	0	0	0
Bald Eagle	1	1	0	0	House Finch	0	1	0	0
Barn Owl	0	6	0	0	House Wren	0	1	0	0
Barn Swallow	0	4	0	1	Laughing Gull	0	1	0	0
Barred Owl	2	9	1	5	Mallard	0	24	0	0
Blackbirds (mixed)	4	4	0	2	Merlin	0	1	0	0
Blue Jay	0	6	0	1	Mockingbird	0	1	0	0
Bonaparte's Gull	0	1	0	0	Mourning Dove	0	4	0	0
Canada Geese	25	70	0	105	Northern Cardinal	0	2	0	0
Cedar Waxwing	1	1	0	1	Osprey	1	1	0	0
Common Grackle	0	0	0	2	Pea Fowl	0	1	0	0
Common Loon	0	4	0	0	Peregrine Falcon	1	0	0	0
Common Raven	1	3	0	4	Pileated Woodpecker	1	3	1	9
Cooper's Hawk	0	3	0	0	Purple Finch	0	2	0	0
Double-crested Cormorant	8	4	4	8	Red-tailed Hawk	9	8	0	3
Downy Woodpecker	0	1	0	3	Red-winged Blackbird	4	1	0	1
Eastern Kingbird	0	1	0	0	Ring-billed Gull	0	11	1	6
Eastern Screech Owl	0	2	0	0	Rose-breasted Grosbeak	0	1	0	0
English (house) Sparrow	1	11	1	4	Ruby-throated Hummingbird	0	1	0	0
European Starling	90	9	0	6	Ruffed Grouse	0	6	0	0
Field Sparrow	0	1	0	0	Sandhill Crane	0	1	0	0
Feral Chicken	0	3	0	1	Sharp-shinned Hawk	1	8	0	0
Feral Geese	0	1	0	0	Snowy Owl	0	4	0	1
Feral Pigeon	13	23	1	18	Tree Swallow	0	2	0	0
Gray Catbird	0	1	0	0	Turkey Vulture	0	1	0	2
Great Blue Heron	7	7	2	2	Wild Turkey	18	6	0	8
Hairy Woodpecker	0	0	0	3	Yellow-bellied Sapsucker	1	0	0	1
					Total	195	329	13	213

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

Need to Resolve Bird Damage to Agricultural Resources

According to the National Agricultural Statistics Service (NASS), Vermont had approximately 1,251,713 acres of farm land in 2012 with a market value of agricultural products sold estimated at about $776,105,000 (NASS 2014). "Milk from cows" ($504,884,000/65.1%) and "other crops and hay" ($88, 265,000/11.4%) were the top two farm commodities for cash receipts. Together they accounted for almost 76.5% of the total cash receipts for the state and were worth over $593 million dollars. The 2013 livestock inventory estimated approximately 415,000 (408,393 "cattle and calves" and milk cows 2012) head of cattle and 15 million broilers within Vermont (NASS 2014). Milk production had $555 million in cash receipts Vermont (NASS 2014).

Agriculture was worth $776 million to the Vermont economy (VAAFM 2014 website). Sales from milk alone were $504 million. There are about 7,338 farms of which 934 are dairy farms. Vermont has approximately 134,142 dairy cows. Vermont produces more than 2 billion pounds of milk annually.

The economic significance of feed losses to starlings and blackbirds has been demonstrated by Besser et al. (1968) who concluded that the value of losses in feedlots near Denver, Colorado was $84 per 1,000 birds in 1967. Forbes (1995) reported European starlings consumed up to 50% of their body weight in feed each day. Glahn and Otis (1981) reported losses of 4.8 kg of pelletized feed consumed per 1,000 bird minutes. Glahn (1983) reported that 25.8% of farms in Tennessee experienced starling depredation problems of which 6.3% experienced considerable economic loss.

When large flocks of birds selectively forage for components in livestock feeds, the composition and the energy value of the feed can be altered which can negatively affect the health and production of livestock. The removal of this high-energy source by birds, is believed to reduce milk yields, weight gains, and is economically critical (Feare 1984). Glahn and Otis (1986) reported that starling damage was also associated with proximity to roosts, snow, and freezing temperatures and the number of livestock on feed.

A variety of bird species can cause damage to agricultural resources. Damage and threats of damage to agricultural resources is often associated with bird species that exhibit flocking behaviors (e.g., red-winged blackbirds, European starlings, Canada geese) or colonial nesting behavior (e.g., pigeons, cormorants, gulls). Damage occurs through direct consumption of agricultural resources, the contamination of resources from fecal droppings, or the threat of disease transmission to livestock from contact with fecal matter. As shown in Table 1.2, many of the bird species addressed have been identified as causing or posing threats to agricultural resources.

Several studies have shown that European starlings can pose a great economic threat to agricultural producers (Besser et. al. 1968, Dolbeer et.al. 1978, and Feare 1984). Fruit and nut crops can be damaged by blackbirds, American crows, gulls, and other birds. Gulls cause damage by feeding and defecating on vegetable crops. Starlings and sparrows can also have a detrimental impact on agricultural food production by feeding at vineyards, orchards, gardens, crops, and feedlots (Weber 1979). For example, starlings feed on numerous types of fruits such as, cherries, figs, blueberries, apples, apricots, grapes, nectarines, peaches, plums, persimmons, strawberries, and olives (Weber 1979). European starlings, house sparrows, and, to a lesser extent, pigeons, often cause damage at cattle feeding facilities and dairies by congregating in large numbers to feed on the grain component of cattle feed. Such feeding activities present disease threats to livestock at these sites. The birds also cause damage by defecating on fences, shade canopies, and other structures, which can accelerate corrosion of metal components and which generally is considered an unsightly nuisance and potential health hazard for the feedlot/dairy operators and their personnel.

Canada geese graze a variety of crops, including alfalfa, barley, beans, corn, soybeans, wheat, rye, oats, spinach, and peanuts (Atlantic Flyway Council 1999). A single intense grazing event by Canada geese in fall, winter or spring can reduce the yield of winter wheat by 16-30% (Fledger et al. 1987), and reduce growth of rye plants by >40% (Conover 1988). However, some have reported that grazing by geese during the winter may increase rye or wheat seed yields (Clark and Jarvis 1978, Allen et al. 1985). The most common Canada goose damage to agricultural resources in Vermont is depredation on field corn, alfalfa, rye and wheat. Damage is primarily consumption (and loss of the crop and revenue), but also consists of unacceptable accumulations of feces on pastures, trampling of crops, and increased erosion and runoff from fields where the cover crop has been grazed.

Damage to Aquaculture Resources

Damage to aquaculture resources occurs primarily from the economic losses associated with birds consuming fish and other commercially raised aquatic organisms. Damage can also result from the death of fish and other aquatic wildlife from injury associated with bird predation as well as the threat of disease transmission from one impoundment to another or from one aquaculture facility to other facilities as birds move between sites. The introduction of a disease can result in substantial economic losses since the entire impoundment is likely to become infected, which can result in extensive mortality.

In Vermont, there are five state operated, two federal fish hatcheries, and seven private and commercial fish hatcheries (VOGA website 2014). The majority of the hatcheries within Vermont are used to raise fish for recreation. The 2011 U.S. Fish & Wildlife survey on hunting, fishing and wildlife-associated recreation, coupled with the 2010 Vermont angler survey, estimated that stocked fish contribute roughly $31.6 million annually in angler expenditures to Vermont's economy. These hatcheries can also exhibit economic losses associated with birds consuming the recreational fish at the hatchery and more so at the stocking locations, such as brooks, rivers, ponds and lakes.

During a survey of aquaculture facilities in the northeastern United States, 76% of respondents identified the great blue heron as the bird of highest concern regarding predation (Glahn et al. 1999). Glahn et al. (1999) found that 80% of the aquaculture facilities surveyed in the northeastern United States perceived birds as posing an economic threat due to predation which coincided with 81% of the facilities surveyed having birds present on aquaculture ponds. The primary species causing damage as reported in Vermont are double crested cormorants and great blue herons.

Damage and Threats to Livestock Operations

Damage to livestock operations can occur from several bird species (USDA 2004). Economic damage can occur from bird consumption of livestock feed and from the increased risks of disease transmission associated with large concentrations of birds. Although damage and disease threats to livestock operations can occur throughout the year, damage is highest during those periods when birds are concentrated into large flocks such as migration periods and during winter months when food sources are limited. For some bird species, such as barn swallows, high concentrations of birds can be found during the breeding season where suitable nesting habitat exists.

Of primary concern to livestock operations are European starlings, house/English sparrows, crows, hawks and feral pigeons. The flocking behavior of European starlings, house/English sparrows, crows, and feral pigeons either from feeding, roosting and/or nesting behavior can lead to economic losses to agricultural producers from the consumption of livestock feed. Economic damages associated with starlings and blackbirds feeding on livestock rations has been documented in France and Great Britain (Feare 1984), and in the United States (Besser et al. 1968, Dolbeer et al. 1978, Glahn and Otis 1981, Glahn 1983, Glahn and Otis 1986). Starlings damage an estimated $800 million worth of agricultural resources per year (Pimentel et al. 2000). Diet rations for cattle contain all of the nutrients and fiber that cattle need, and are so thoroughly mixed that cattle are unable to select any single component over others. Livestock feed and rations are often formulated to ensure proper health of the animal. Higher fiber roughage in livestock feed is often supplemented with corn, barley, and other grains to ensure weight gain and in the case of dairies, for dairy cattle to produce milk. Livestock are unable to select for certain ingredients in livestock feed while birds often can selectively choose to feed on the corn, barley, and other grains formulated in livestock feed. Livestock feed provided in open troughs is most vulnerable to feeding by birds. Birds often select for those components of feed that are most beneficial to the desired outcome of livestock.

In addition, large concentrations of birds feeding, roosting, and/or loafing at livestock operations increase risks of disease transmission from fecal matter being deposited in areas where livestock feed, water, and are housed. Birds feeding in open troughs on livestock feed can leave fecal deposits, which can be consumed by livestock. Fecal matter can also be deposited in sources of water for livestock, which increases the likelihood of disease transmission and can contaminate other surface areas where livestock can encounter fecal matter deposited by birds. Many bird species, especially those encountered at livestock operations, are known to carry infectious diseases which can be excreted in fecal matter and pose not only a risk to individual livestock operations, but can be a source of transmission to other livestock operations as birds move from one area to another. A number of diseases that could affect livestock have been associated with rock pigeons, European starlings, and house sparrows and are described in Table 1.3 (Weber 1979).

Table 1.3 – Diseases of livestock that have been linked to feral domestic pigeons, European starlings, blackbirds, and/or English sparrows. Information from Weber 1979.

Disease	Livestock affected	Symptoms	Comments
Bacterial:			
Erysipeloid	Cattle, swine, horses, sheep, goats, chickens, turkeys, ducks	Pigs - arthritis, skin lesions, necrosis, septicemia Sheep - lameness	serious hazard for the swine industry, rejection of swine meat at slaughter due to speticemia, also affects dogs
Salmonellosis	All domestic animals	abortions in mature cattle, mortality in calves, decrease in milk production in dairy cattle Colitis in pigs,	Over 1700 serotypes
Pasteurellosis	cattle, swine, horses, rabbits, chickens, turkey	Chickens and turkeys die suddenly without illness pneumonia, bovine mastitis, abortions in swine, septicemia, abscesses	Also affects cats and dogs
Avian tuberculosis	chickens, turkeys, swine, cattle, horses, sheep	Emaciation, decrease in egg production, and death in poultry. Mastitis in cattle	Also affects cats and dogs
Streptococcosis	cattle, swine, sheep, horses, chickens, turkeys, geese, ducks, rabbits	Emaciation and death in poultry. Mastitis in cattle, abscesses and inflammation of the heart , and death in swine	feral pigeons are susceptible and aid in transmission
yersinosis	cattle, sheep, goats, horses, turkeys, chickens, ducks	abortion in sheep and cattle	Also affects dogs and cats
vibriosis	cattle and sheep	In cattle, often a cause of infertility or early embryonic death. In sheep, the only known cause of infectious abortion in late pregnancy	Of great economic importance
Listeriosis	Chickens, ducks, geese, cattle, horses, swine, sheep, goat	In cattle, sheep, and goats, difficulty swallowing, nasal discharge, paralysis of throat and facial muscles	Also affects cats and dogs
Viral:			
meningitis	cattle, sheep, swine, poultry	inflammation of the brain, newborn calves unable to suckle	associated with listeriosis, salmonellosis, cryptococcosis
Encephalitis (7 forms)	horses, turkeys, ducks	drowsiness, inflammation of the brain	Mosquitos serve as vectors
Mycotic (fungal):			
aspergillosis	cattle, chickens, turkeys, and ducks	abortions in cattle	common in turkey poults
Blastomycosis	weight loss, fever, cough, bloody sputum and chest pains.	Rarely	Affects horses, dogs, and cats
candidiasis	cattle, swine, sheep, horses, chickens, turkeys	In cattle, mastitis, diarrhea, vaginal discharge, and aborted fetuses	causes unsatisfactory growth in chickens

Cryptococcosis	cattle, swine, horses	chronic mastitis in cattle, decreased milk flow and appetite loss	Also affects dogs and cats
histoplasmosis	horses cattle and swine	(in dogs) chronic cough, loss of appetite, weakness, depression, diarrhea, extreme weight loss	also affects dogs; actively grows and multiplies in soil and remains active long after birds have departed
Coccidiosis	poultry, cattle, and sheep	bloody diarrhea in chickens, dehydration, retardation of growth	almost always present in English sparrows; also found in pigeons and European starlings
Protozoal:			
American trypanosomiasis	infection of mucous membranes of eyes or nose, swelling	possible death in 2-4 weeks	caused by the conenose bug found on pigeons
toxoplasmosis	cattle, swine, horses, sheep, chickens, turkeys	In cattle, muscular tremors, coughing, sneezing, nasal discharge, frothing at the mouth, prostration and abortion	Also affects dogs and cats
Rickettsial/Chlamydial:			
chlamydiosis	cattle, horses, swine, sheep, goats, chickens, turkeys, ducks, geese	In cattle, abortion, arthritis, conjunctivitis, enteritis	also affects dogs and cats and many wild birds and mammals
Q fever	affects cattle, sheep, goats, and poultry	may cause abortions in sheep and goats	can be transmitted by infected ticks

Although birds are known to be carriers of diseases (vectors) that are transmissible to livestock, the rate that transmission occurs is unknown, but is likely to be low. Since many sources of disease transmission exist, identifying a specific source can be difficult. Birds are known to be vectors of disease, which increases the threat of transmission when large numbers of birds are defecating and contacting surfaces and areas used by livestock.

Carlson et al. (2011) reported that European starlings have the potential to transmit *salmonella* to livestock through droppings in feed troughs and contaminating drinking water troughs; they found that the probability of *salmonella* contamination of feed and water troughs increased as the presence of starlings increased. Birds also cause damage by defecating on fences, shade canopies, and other structures, which can accelerate corrosion of metal components and can be aesthetically displeasing. Large concentrations of birds at livestock feeding operations can also pose potential health hazards to feedlot/dairy operators and their personnel through directly contacting fecal droppings or by droppings creating unsafe working conditions.

WS actively conducts avian health surveillance surveys to test for the prevalence of avian influenza viruses, Newcastle disease, and arboviruses including eastern equine encephalitis, St. Louis encephalitis, West Nile virus, and Turlock virus in various wild bird species. Newcastle disease is a concern for poultry farms with its ability to wipe out an entire farm with almost 100% mortality and cause severe economic losses. Newcastle virus can be spread to poultry through contaminated feces and respiratory secretions of wild birds; chickens in particular are highly susceptible to severe illnesses from the virus and very high mortality rates are likely (APHIS 2015).

The four arboviruses surveyed in Vermont by WS include eastern equine encephalitis, St. Louis encephalitis, West Nile virus, and Turlock virus. Although arboviruses are actually transmitted to humans and domestic animals through mosquitos, wild birds serve as a reservoir to transmit the virus to more mosquitos (Gubler 2006). Eastern equine encephalitis, St. Louis encephalitis, and West Nile virus have the potential to infect and cause mortality in primarily horses, but other domestic animals as well. Turlock virus has a higher potential to infect domestic birds, instead of humans and domestic animals.

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

Wild and domestic waterfowl are the acknowledged natural reservoirs for a variety of avian influenza viruses (Davidson and Nettles 1997). Avian influenza circulates among those birds without clinical signs and is not an important mortality factor in wild waterfowl (Davidson and Nettles 1997). However, the potential for avian influenza to produce devastating disease in domestic poultry makes its occurrence in waterfowl an important issue (Davidson and Nettles 1997, USDA 2005).

Damage to Agricultural Crops

Besser (1985) estimated damage to agricultural crops associated with birds exceeded $100 million annually in the United States. Bird damage to agricultural crops occurs primarily from the consumption of sprouting crops (*i.e.*, loss of the crop and revenue), but also consists of trampling of emerging crops by waterfowl, damage to fruits associated with feeding, and fecal contamination. In 2012, the sale of all crops totaled 126.5 million dollars in Vermont; the sale of hay, corn, apples, soybeans, peaches, and wheat accounted for 13.9% of the total market value of agricultural products sold (NASS 2012). There are four major fruit and berry crops grown in VT: apples, strawberries, raspberries and blueberries. The total value of fruits, berries, tree nuts and vegetable crops grown in VT was $34.7 million in 2012 (VAAFM website 2014). The total production of apples during 2012 amounted to 34 million pounds, with the value of production estimated at $15.3 million (New England Agriculture Statistics Service 2014). Bird damage to agricultural resources reported to WS includes, but is not limited to the following: American crow damage to field corn, American crow damage to cucumbers, Canada geese damage to rye, wheat and alfalfa, snow geese damage to clover, rye, wheat and alfalfa, rock dove damage to field corn and other grains, European starling damage to field corn, sweet corn, and other grains, and wild turkey damage to grapes, strawberries, field corn and other grains.

Waterfowl can graze and trample a variety of crops, including alfalfa, barley, corn, soybeans, wheat, rye, and oats (Cleary 1994). For example, a single intense grazing event by Canada geese in fall, winter, or spring can reduce the yield of winter wheat by 16 to 30% (Fledger et al. 1987), and reduce growth of rye plants by more than 40% (Conover 1988). However, some research has reported that grazing by geese during the winter may increase rye or wheat seed yields (Clark and Jarvis 1978, Allen et al. 1985). Since 1985, agricultural practices have changed resulting in intensive wheat growing methods with much higher yields of approximately 100 bushels per acre, but these crops are unable to sustain even light grazing pressure without losing yield. Associated costs with agricultural damage involving waterfowl include costs to replant grazed crops (e.g., soybeans, corn, peanuts), implement non-lethal wildlife management practices, purchase replacement hay, and decreased yields.

Bird damage to sweet corn can also result in economic losses to producers with damage often amplified since damage to sweet corn caused by birds makes the ear of corn unmarketable since damage is unsightly to the consumer (Besser 1985). Large flocks of red-winged blackbird are responsible for most of the damage reported to sweet corn with damage also occurring from grackles and starlings within the United States (Besser 1985). Damage occurs when birds rip or pull back the husk exposing the ear for consumption. Most bird damage occurs during the development stage known as the milk and dough stage

when the kernels are soft and filled with a milky liquid, which the birds puncture to ingest the contents. Once punctured, the area of the ear damage often discolors and is susceptible to disease introduction into the ear (Besser 1985). Damage usually begins at the tip of the ear as the husk is ripped and pulled back but can occur anywhere on the ear (Besser 1985).

Damage can also occur to sprouting corn as birds pull out the sprout or dig the sprout up to feed on the seed kernel (Besser 1985). Damage to sprouting corn occurs primarily from crows but red-winged blackbirds, grackles, and common ravens are known to cause damage to sprouting corn (Mott and Stone 1973). Additionally, starlings may pull sprouting grains and feed on planted seed (Johnson and Glahn 1994). Damage to sprouting corn is likely localized and highest in areas where breeding colonies of exist in close proximity to agricultural fields planted with corn (Mott and Stone 1973, Rogers and Linehan 1977). Rogers and Linehan (1977) found that grackles damaged two corn sprouts per minute on average when present at a field planted near a breeding colony. Corn growers in Vermont report damage to sprouting corn from Canada geese, American crows and wild turkeys.

Fruit crops and maples syrup production can be damaged by crows, robins, starlings, red-winged blackbirds, grackles, cowbirds, woodpeckers, sapsuckers and American crows. WS has received requests for assistance to alleviate damage to fruit crops associated with Canada geese and wild turkeys. Besser (1985) estimated bird damage to grapes, cherries, and blueberries exceed $1 million dollars annually in the United States. In 1989, Avery, Nelson, and Cone (1991) estimated that bird damage may have cost growers $8.5 million nationwide. Red-winged blackbirds, cowbirds, woodpeckers, and crows are also known to cause damage to blueberries (Besser 1985). Damage to blueberries typically occurs from birds plucking and consuming the berry (Besser 1985). Vermont is also the number one producer of maple syrup with over 1.3 million gallons of maple syrup produced in 2012 (VAAFM 2014) from roughly 4.2 million taps (VAAFM 2014). Bird damage associated with maple syrup production is generally caused by birds such as woodpeckers and sapsuckers.

In 2014, Vermont grew 29 million pounds of apples, ranking it 15th in the country (NASS 2014). Damage to apples occurs from beak punctures which makes the apples unmarketable (Besser 1985). Crows and robins have been documented as causing damage to apples (Mitterling 1965).

Need to Resolve Threats that Birds Pose to Human Safety

Several bird species listed in Table 1.2 can be closely associated with human habitation and often exhibit gregarious roosting behavior, such as vultures, waterfowl, crows, starlings, and pigeons. The close association of those bird species with human activity can pose threats to human safety from disease transmission, threaten the safety of air passengers if birds are struck by aircraft, excessive droppings can be aesthetically displeasing, and aggressive behavior, primarily from waterfowl, can pose risks to human safety. Human health and safety concerns and problems associated with birds include, but are not limited, to transmission of zoonotic diseases to humans, injury from aggressive waterfowl, and bird-aircraft strikes.

Birds play an important role in the transmission of zoonotic diseases to humans such as Encephalitis, West Nile Virus, Psittacosis, and Histoplasmosis. Public health officials and residents at such sites express concerns for human health related to the potential for disease transmission where dropping deposits accumulate. Some bird species form large communal roosts of the kind associated with disease organisms which grow in soils enriched by bird excrement, such as Histoplasma capsulatum (Weeks and Stickley 1984). Sometimes, such roosts occur in urban and suburban areas.

Threat of Disease Transmission

Birds can play an important role in the transmission of zoonotic diseases (i.e., animal diseases transmissible to humans) where humans may encounter fecal droppings of those birds. As many as 65 different diseases transmittable to humans or domestic animals have been associated with pigeons, European starlings, and house sparrows; the more common zoonotic diseases affecting humans are described in Table 1.4 (Weber 1979). Few studies are available on the occurrence and transmission of zoonotic diseases in wild birds. Study of this issue is complicated by the fact that some disease-causing agents associated with birds may also be contracted from other sources. The risk of disease transmission from birds to humans is likely very low. The presence of disease causing organisms in bird feces is a result of the pathogens being present in the environment in which birds live. Birds likely acquire disease-causing organisms through ingestion of pathogens that originated in the environment. Disease-causing organisms do not originate within birds (i.e., birds do not produce disease-causing organisms), but those birds can act as reservoirs for disease causing organisms that are of concern to human safety.

Of concern, is the ability of birds to obtain disease causing organisms and transport those organisms to other areas, especially to areas with a high amount of human activity. With the ability to fly and move from one location to another, birds can obtain a disease causing organism at one location and transfer the disease causing organism to another location. Human exposure to fecal droppings through contact or through the disturbance of accumulations of fecal droppings where disease organisms are known to occur increases the likelihood of disease transmission. Birds can be closely associated with human habitation where interaction with birds or fecal droppings can occur. Many bird species often exhibit gregarious behavior, which can lead to accumulations of fecal droppings in areas where those species forage or loaf. Accumulations of feces can be considered a threat to human health and safety due to the close association of those species of birds with human activity. Accumulations of bird droppings in public areas are aesthetically displeasing and are often found in areas where humans may be exposed.

In most cases in which human health concerns are a major reason for requesting assistance, no actual cases of bird transmission of disease to humans have been proven to occur. Thus, the primary reason for requesting assistance is the risk of disease transmission.

Escherichia coli are fecal coliform bacteria associated with fecal material of warm-blooded animals. There are over 200 specific serological types of *E. coli* with the majority of serological types being harmless (Sterritt and Lester 1988). Probably the best-known serological type of *E. coli* is *E. coli* O157:H7, which is usually associated with cattle (Gallien and Hartung 1994). Many communities monitor water quality at swimming beaches and lakes, but lack the financial resources to pinpoint the source of elevated fecal coliform counts. When fecal coliform counts at swimming beaches exceed established standards, the beaches are temporarily closed which can adversely affect the enjoyment of the area by the public, even though the serological type of the *E. coli* is unknown. During droughts when the water levels have been low, there have been increased bacteria levels found at several Army Corps of Engineers swimming facilities, and when the levels exceed the safety standards these areas have been closed in the past. The swimming beach at Beltzville State Park in Pennsylvania was closed over five times in 2014 due to fecal droppings from Canada geese (Shortell 2014). Schools in Vermont have had issues with Canada geese on their athletic fields and have been forced to close the facilities and cancel athletic activities for the students due to the fecal contamination. Town beaches have also closed because of fecal contamination from geese in Vermont.

Table 1.4 - Diseases transmissible to humans that are associated with feral domestic pigeons, European starlings, And English sparrows. Information from Weber (1979)

Disease	Human Symptoms	Potential for Human Fatality
Bacterial:		
erysipeloid	skin eruption with pain, itching; headaches, chills, joint pain, prostration, fever, vomiting	sometimes - particularly to young children, old or infirm people
salmonellosis	gastroenteritis, septicaemia, persistent infection	possible, especially in individuals weakened by other disease or old age
Pasteurellosis	respiratory infection, nasal discharge, conjunctivitis, bronchitis, pneumonia, appendicitis, urinary bladder inflammation, abscessed wound infections	Rarely
Listeriosis	conjunctivitis, skin infections, meningitis in newborns, abortions, premature delivery, stillbirth	sometimes - particularly with newborns
Viral:		
meningitis	inflammation of membranes covering the brain , dizziness, and nervous movements	possible — can also result as a secondary infection with listeriosis, salmonellosis, cryptococcosis
encephalitis (7 forms)	headache, fever, stiff neck, vomiting, nausea, drowsiness, disorientation	mortality rate for eastern equine encephalomyelitis may be around 60%
Mycotic (fungal):		
aspergillosis	affects lungs and broken skin, toxins poison blood, nerves, and body cells	Not usually
blastomycosis	weight loss, fever, cough, bloody sputum and chest pains.	Rarely
candidiasis	infection of skin, fingernails, mouth, respiratory system, intestines, and urogenital tract	Rarely
cryptococcosis	lung infection, cough, chest pain, weight loss, fever or dizziness, also causes meningitis	possible especially with meningitis
histoplasmosis	pulmonary or respiratory disease. May affect vision	possible, especially in infants and young children or if disease disseminates to the blood and bone marrow
Protozoal:		
American trypanosomiasis	infection of mucous membranes of eyes or nose, swelling	possible death in 2-4 weeks
toxoplasmosis	inflammation of the retina, headaches, fever, drowsiness, pneumonia, strabismus, blindness, hydrocephalus, epilepsy, and deafness	Possible
Rickettsial /Chlamydial:		
chlamydiosis	pneumonia, flu-like respiratory infection, high fever, chills, loss of appetite, cough, severe headaches, generalized aches and pains, vomiting, diarrhea, hepatitis, insomnia, restlessness, low pulse rate	occasionally, restricted to old, weak or those with concurrent diseases
Q fever	sudden pneumonitis, chills, fever, weakness, severe sweating, chest pain, severe headaches and sore eyes	possible

While transmission of diseases or parasites from birds to humans has not been well documented, the potential exists (Luechtefeld et al. 1980, Wobeser and Brand 1982, Hill and Grimes 1984, Pacha et al. 1988, Blankespoor and Reimink 1991, Graczyk et al. 1997, Saltoun et al. 2000, Kassa et al. 2001). In some cases, infections may even be life threatening for immunocompromised and immunosuppressed people (Roffe 1987, Graczyk et al. 1998). Even though many people are concerned about disease transmission from feces, the probability of contracting a disease from feces is believed to be small. Financial costs related to human health threats involving birds may include testing of water for *coliform* bacteria, cleaning and sanitizing public-use areas, contacting and obtaining assistance from public health officials, and implementing non-lethal and lethal methods of wildlife damage management to reduce risks. WS recognizes and defers to the authority and expertise of local and state health officials in determining what does or does not constitute a threat to public health.

Threat of Aircraft Striking Wildlife at Airports and Military Installations

In addition to threats of zoonotic diseases, birds also pose a threat to human safety from being struck by aircraft. Birds struck by aircraft, especially when ingested into engines, can lead to structural damage to the aircraft and can cause catastrophic engine failure. The civil and military aviation communities have acknowledged that the threat to human health and safety from aircraft collisions with wildlife is increasing (Dolbeer 2000, MacKinnon et al. 2001). Collisions between aircraft and wildlife are a concern throughout the world because wildlife strikes threaten passenger safety (Thorpe 1996), result in lost revenue, and repairs to aircraft can be costly (Linnell et al. 1996, Robinson 1996). Aircraft collisions with wildlife can also erode public confidence in the air transportation industry as a whole (Conover et al. 1995).

Vermont has 127 total registered airports, including ten military heliports (G. Rouelle 2014, per. communication). Certificated airports are subject to Federal Aviation Administration (FAA) Federal Aviation Regulations Part 139. Airports that are certified under Part 139 are designated based on the size of passenger aircraft that use the airport. This more typically includes larger airports with commercial service. Part 139 airports are held to a much higher standard to reduce wildlife strikes to be able to maintain their certification. Birds pose the greatest strike threat to aviation.

When birds enter or exit a roost in large flight lines at or near airports or when present in large flocks foraging on or near an airport, those bird species represent a safety threat to aviation. Vultures and raptors can also present a risk to aircraft because of their large body mass and slow-flying or soaring behavior. Vultures are considered the most hazardous bird for an aircraft to strike based on the frequency of strikes, effect on flight, and amount of damage caused by vultures throughout the country (Dolbeer et al. 2000). American kestrels, raptors and gull species are attracted to airfields for various prey items such as small rodents, insects (grasshoppers, crickets, etc.) and earthworms. Mourning doves, horned larks, snow buntings, crows, and robins also present risks when their late summer behaviors include creating large roosting, feeding and loafing flocks. Their feeding, watering, and gritting behavior on airport turf and runways further increases the risk of bird-aircraft collisions.

From 1990 through 2014, 238 birds have been reported as struck by aircraft in Vermont. This comprises 97% of the total wildlife strikes reported. During this time, 36 of the strikes have occurred from American kestrels while there have been 23 gull strikes. The number of actual bird strikes is likely to be much greater since an estimated 80% of civil bird strikes may go unreported (Linnell et al. 1999, Cleary et al. 2005, Wright and Dolbeer 2005). Generally, bird collisions occur when aircraft are near the ground during take-off and approach to the runway.

Birds being struck by aircraft can cause substantial damage. Bird strikes can cause catastrophic failure of aircraft systems (e.g., ingesting birds into engines) which can cause the plane to become uncontrollable and can lead to crashes. Injuries also occur from bird strikes to pilots and passengers. Several reports of minor damage to aircraft have occurred due to strikes from gulls, crows, and unknown (large) bird species at Vermont airports.

Additional Human Safety Concerns Associated with Birds

As people are increasingly living with wildlife, the lack of harassing and threatening behavior by people toward many species of wildlife, especially around urban areas, has led to a decline in the fear wildlife have toward humans. When wildlife species begin to habituate to the presence of people and human activity, a loss of apprehension occurs that can lead those species to exhibit threatening behavior toward people. This threatening behavior continues to increase as human populations expand and the populations of those species that adapt to human activity increase (Lowry et all. 2013). Threatening behavior can be

in the form of aggressive posturing, a general lack of apprehension toward people, or abnormal behavior. Although birds attacking people occurs rarely, aggressive behavior by birds does occur, especially during nest building and the rearing of eggs and chicks. Raptors can aggressively defend their nests, nesting areas, and young, and may swoop and strike at pets, children, and adults.

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

Need to Resolve Bird Damage Occurring to Property

Threats of damage to human health and safety can occur in a variety of ways and can result in costly repairs and clean-up. One example would be when a public beach needs to be closed due to elevated bacteria counts in the water resulting from Canada geese loafing and increasing fecal matter in the immediate vicinity. . Bird damage to property occurs through direct damage to structures, through roosting behavior, and through their nesting activities. Another example of direct damage to property occurs when vultures tear roofing shingles or pull out latex caulking around windows. Accumulations of fecal droppings can cause damage to buildings and statues. Woodpeckers also cause direct damage to property through excavating holes in buildings, either for nesting purposes or to locate food; this can remove insulation and allows water and other wildlife to enter the building. Aircraft striking birds can also cause substantial damage requiring costly repairs and aircraft downtime. Direct damage can also result from birds that act aggressively toward their reflection in mirrors and windows, which can scratch paint and siding.

Birds frequently damage structures on private property and public facilities with fecal contamination. Accumulated bird droppings can reduce the functional life of some building roofs by 50% (Weber 1979). Corrosion damage to metal structures and painted finishes, including those on automobiles, can occur because of uric acid from bird droppings. Electrical utility companies frequently have problems with birds (nesting, roosting, and loafing) and bird droppings causing power outages by shorting out transformers, power lines, and substations. This has resulted in hundreds of thousands of dollars of outage time for power companies. In addition to causing power outages noted above, property damage from black vultures can include tearing and consuming latex window caulking or rubber gaskets sealing window panes, asphalt and cedar roof shingles, vinyl seat covers from boats, patio furniture, and ATV seats. Vultures also cause damage to cell phone and radio towers by roosting on critical tower infrastructure.

Damage to property associated with large concentrations of roosting birds occurs primarily from accumulations of droppings and feather debris. Birds that routinely roost and loaf in the same areas often leave large accumulations of droppings and feather debris, which is aesthetically displeasing and can cause damage to property. The recurring presence of fecal droppings under bird roosts can lead to repeated cleaning costs for property owners. Fecal accumulation from birds roosting in power plants and at industrial parks can lead to property damage to the facility as well as become a health hazard for workers. Costs associated with property damage include labor and disinfectants to clean and sanitize fecal droppings, implementation of non-lethal wildlife management methods, loss of property use, loss of aesthetic value of flowers, gardens, and lawns consumed by geese, loss of customers or visitors irritated

by walking in fecal droppings, repair of golf greens, and replacing grazed turf. The costs of re-establishing overgrazed lawns and cleaning waterfowl feces from sidewalks have been estimated at more than $60 per bird (Allan et al. 1995).

Bird conflicts associated with landfills include accumulation of feces on equipment and buildings, distraction of heavy machinery operators, and the potential for birds to transmit disease to workers on the site. The tendency for birds to carry waste off site results in the deposition of garbage on surrounding industrial and residential areas which creates a nuisance, as well as increases the risks of disease transmission. From FY 2010 to FY 2014, WS has dispersed over 197,000 birds from one landfill in Vermont.

Need to Resolve Bird Damage Occurring to Natural Resources

Natural resources may be described as those assets belonging to the public which are usually managed and held in trust by government agencies for citizens. Such resources may be plants, animals and their habitats, including threatened and endangered species and historic properties. Examples of natural resources in Vermont include the USFWS Missisquoi National Fish and Wildlife Refuge, the USFWS Silvio O. Conte National Wildlife Refuge, USDA Forest Service, Green Mountain National Forest, Vermont State Parks, historic structures and places, parks and recreation areas, natural areas, including unique habitats or topographic features, threatened and endangered plants or animals, and any plant or animal populations which have been identified by the public as a natural resource.

Damage to natural resources has occurred over the past five year mostly from double-crested cormorants and ring-billed gulls. While it can be difficult to assign a value to the damage to natural resources, birds can negatively affect natural resources through habitat degradation, competition with other wildlife, and through direct depredation on natural resources. Habitat degradation occurs when large concentrations of birds in a localized area negatively affect characteristics of the surrounding habitat, which can then adversely affect other wildlife species and become aesthetically displeasing. Competition can occur when two species compete (usually to the detriment of one species) for available resources, such as food or nesting sites. Direct depredation occurs when predatory bird species feed on other wildlife species, which can negatively influence those species' populations, especially when depredation occurs on threatened and endangered (T&E) species.

Double-crested cormorants can displace colonial species such as black-crowned night herons, egrets, great blue herons, gulls, common terns, and Caspian terns through habitat degradation and nest site competition (USFWS 2003b). Cuthbert et al. (2002) examined potential impacts of cormorants on great blue herons and black-crowned night-herons in the Great Lakes and found that cormorants have not negatively influenced breeding distribution or productivity of either species at a regional scale, but did contribute to declines in heron presence or site abandonment in certain site specific circumstances. Furthermore, Cuthbert et al. (2002) did find that cormorants have negative impacts on normal plant growth and survival on a localized level in the Great Lakes region. In Vermont on Young Island in Lake Champlain, gulls and double-crested cormorants have displaced other species of colonial nesting birds such as black-crowned night herons, cattle egret, snowy egret, black duck, mallard, common goldeneye, common merganser, tree swallow, red-winged blackbird, common grackle, green-backed heron, great blue heron, wood duck and gadwall on mainly through the degradation of habitat and competition for nest sites (J. Gobeille, VFWD personal communication). Accumulation of cormorant droppings (which contribute excessive ammonium nitrogen), stripping leaves for nesting material, and the combined weight of the birds and their nests can break branches and ultimately kill many trees within three to ten years (Bedard et al. 1995, Korfanty et al. 1999, Lemmon et al. 1994, Lewis 1929, Weseloh et al.1995, Weseloh and Ewins 1994, Weseloh and Collier 1995). Tree damage may be perceived as a problem if these trees are rare species, or aesthetically valued (Hatch and Weseloh 1999).

Waterfowl, especially Canada geese, may cause unsanitary, unaesthetically pleasing fecal accumulations in natural areas such as state and federal parks and recreational areas. When waterfowl reside near recreational swimming areas, the accumulation of fecal matter can contaminate the water forcing the area to be closed to swimming. The EPA established recreational water quality criteria for freshwater that recommend that water body geometric mean levels should not be greater than 30 cfu of enterococci per 100 mL and 126 cfu of *E. coli* per 100 mL to maintain an estimated illness rate of 32 per 1,000 primary contact recreators (EPA 2012). Swimmers were cautioned to avoid the water in Buckeye Lake, located east of Columbus, Ohio in July 2014 due to the *E. coli* levels reaching a record high that was 40 times greater than federal safety threshold; the accumulation of geese and gull feces was identified as a contributing factor that led to these high levels (Associated Press 2014). Not only are geese known for contaminating water sources, but they are also known to cause degradation to habitat. WS annually receives calls regarding goose damage to newly planted seedlings, alfalfa and invasive weed transmission to organic fields.

1.4 DECISIONS TO BE MADE

Based on agency relationships, MOUs, and legislative authorities, WS is the lead agency for this EA, and therefore, responsible for the scope, content, and decisions made. Management of migratory birds is the responsibility of the USFWS. As the authority for the overall management of bird populations, the USFWS was involved in the development of the EA and provided input throughout the EA preparation process to ensure an interdisciplinary approach according to the NEPA and agency mandates, policies, and regulations. The VFWD is responsible for managing wildlife in the State of Vermont, including birds. The VFWD establishes and enforces regulated hunting seasons, including the establishment of seasons that allow the removal of some of the bird species addressed in this assessment.

For migratory birds, the VFWD can establish hunting seasons for those species under frameworks determined by the USFWS. WS' activities to reduce and/or prevent bird damage would be coordinated with the USFWS and the VFWD, which would ensure WS' actions are incorporated into population objectives established by those agencies. The take of many of the bird species addressed in this EA can only occur when authorized by a depredation permit issued by the USFWS. In addition, WS' annual take of birds to alleviate damage or threats of damage would only occur at levels as specified in depredation permits.

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

- How can WS best respond to the need to reduce bird damage in Vermont?
- Do the alternatives have significant cumulative impacts meriting an Environmental Impact Statement (EIS)?

1.5 SCOPE OF THIS ENVIRONMENTAL ASSESSMENT

Actions Analyzed

This EA evaluates the need for bird damage management to reduce threats to human safety and to resolve damage to property, natural resources, and agricultural resources on federal, state, tribal, municipal, and private land within the State of Vermont, wherever such management is requested by a cooperator. This EA discusses the issues associated with conducting damage management activities to meet the need for action and evaluates different alternatives to meet that need while addressing those issues.

The methods available for use under the alternatives evaluated are provided in Appendix B. The alternatives and Appendix B also discuss how methods would be employed to manage damage and threats associated with birds. Therefore, the actions evaluated in this EA are the use of those methods available under the alternatives by WS to manage or prevent damage and threats associated with birds from occurring when permitted by the USFWS pursuant to the Migratory Bird Treaty Act (MBTA) and in compliance with Vermont statutes and codes.

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

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

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

Native American Lands and Tribes

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

Federal, State, County, City, and Private Lands

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

Period for which this EA is Valid

If the analyses in this EA indicate an Environmental Impact Statement (EIS) is not warranted, this EA would remain valid until WS and the USFWS determine that new needs for action, changed conditions, new issues, or new alternatives having different potential environmental impacts must be analyzed. At that time, this analysis and document would be reviewed and supplemented pursuant to the NEPA. The EA would be reviewed to ensure that activities conducted under the selected alternative occur within the parameters evaluated in the EA. If the alternative analyzing no involvement in bird damage activities by WS were selected, no additional analyses would occur based on the lack of involvement by WS. The monitoring of activities by WS would ensure the EA remained appropriate to the scope of damage management activities conducted by WS in Vermont under the selected alternative, when requested.

Site Specificity

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

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

Chapter 2 of this EA identifies and discusses issues relating to bird damage management in Vermont. The standard WS Decision Model (Slate et al. 1992) would be the site-specific procedure for individual actions conducted by WS (see Chapter 3 for a description of the WS Decision Model and its application). Decisions made using the model would be in accordance with WS' directives[6] and Standard Operating Procedures (SOPs) described in this EA as well as relevant laws and regulations.

The analyses in this EA are intended to apply to any action that may occur in any locale and at any time within Vermont. In this way, WS believes it meets the intent of the NEPA with regard to site-specific analysis and that this is the only practical way for WS to comply with the NEPA and still be able to accomplish the program's mission.

[6]WS' Directives could be found at the following web address: http://www.aphis.usda.gov/wildlife_damage/ws_directives.shtml.

Summary of Public Involvement

Issues and alternatives related to bird damage management as conducted by WS in Vermont were initially developed by WS in consultation with the USFWS and the VFWD. Issues were defined and preliminary alternatives were identified through the scoping process. As part of this process, and as required by the Council on Environmental Quality (CEQ) and APHIS' NEPA implementing regulations, this document will be noticed to the public through legal notices published in local print media, through the APHIS stakeholder registry to parties that have requested to be notified or have been identified to have an interest in the reduction of threats and damage associated with birds, and by posting the EA on the APHIS website at http://www.aphis.usda.gov/wildlifedamage/nepa.

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

1.6 RELATIONSHIP OF THIS DOCUMENT TO OTHER ENVIRONMENTAL DOCUMENTS

Double-crested Cormorant Management in the United States - Final Environmental Impact Statement: The USFWS has prepared a Final EIS (FEIS) on the management of double-crested cormorants (USFWS 2003). WS was a formal cooperating agency during the preparation of the FEIS and adopted the FEIS to support WS' program decisions for its involvement in the management of cormorant damage. WS completed a Record of Decision (ROD) on November 18, 2003 (68 FR 68020).

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

Proposal to Permit Take as provided under the Bald and Golden Eagle Protection Act Final Environmental Assessment: Developed by the USFWS, this EA 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 EA evaluated the authorization of disturbance take of eagles, the removal of eagle nests where necessary to reduce threats to human safety, and the issuance of permits authorizing the lethal take of eagles in limited circumstances, including authorizing take that is associated with, but is not the purpose of, an action (USFWS 2009). A Decision and Finding of No Significant Impact (FONSI) was made for the preferred alternative in the EA. The selected alternative in the EA established new permit regulations for the "*take*" of eagles (see 50 CFR 22.26) and a provision to authorize the removal of eagle nests (see 50 CFR 22.27). The USFWS published a Final Rule on September 11, 2009 (74 FR 46836-46879).

Atlantic Flyway Mute Swan Management Plan 2002-2013: In response to increasing populations of mute swans along the Atlantic Flyway, the Atlantic Flyway Council developed a mute swan plan to reduce swan populations in the Flyway to minimize negative ecological damages occurring to wetland habitats from the overgrazing of submerged aquatic vegetation by swans. Another goal of the Plan is to

reduce swan populations in the Flyway to reduce competition between swans and native wildlife and to prevent the further expansion of mute swans (Atlantic Flyway Council 2003).

Resident Canada Goose Management - Final Environmental Impact Statement: The USFWS has issued a FEIS on the management of resident Canada geese (USFWS 2005). Pertinent and current information available in the FEIS has been incorporated by reference into this Decision/FONSI. The FEIS may be obtained by contacting the Division of Migratory Bird Management, U.S. Fish and Wildlife Service, 4401 North Fairfax Drive, MBSP-4107, Arlington, Virginia 22203 or by downloading it from the USFWS website at http://www.fws.gov/migratorybirds/issues/cangeese/finaleis.htm.

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

***WS' Environmental Assessments*:** WS has previously developed EAs that analyzed the need for action to manage damage associated with several bird species (USDA 2004). WS has also prepared two separate supplements to the EA to evaluate the need to manage damage associated with ring-billed gulls and double-crested cormorants (USDA 2007, USDA 2010). The EA and both supplements identified the issues with managing damage associated with birds and analyzed alternative approaches to meet the specific need identified in those EAs while addressing the identified issues.

Since activities conducted under the previous EA and two supplements will be re-evaluated under this EA to address the new need for action and the associated affected environment, the previous EA and supplements that addressed birds will be superseded by this analysis and the outcome of the Decision issued.

1.7 AUTHORITY OF FEDERAL AND STATE AGENCIES

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

WS' Legislative Authority

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

USFWS' Authority

The USFWS mission is to conserve, protect, and enhance fish and wildlife along with their habitats for the continuing benefit of the American people. Responsibilities are shared with other federal, state, tribal, and local entities; however, the USFWS has specific responsibilities for the protection of T&E species under the ESA, migratory birds, inter-jurisdictional fish, and certain marine mammals, as well as for lands

and waters that the USFWS administers for the management and protection of those resources. The USFWS also manages lands under the National Wildlife Refuge System.

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

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

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

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

United States Environmental Protection Agency (EPA)

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

United States Food and Drug Administration (FDA)

The 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.

Vermont Fish and Wildlife Department (VFWD)

WS and the VFWD currently has a signed MOU, which establishes a cooperative relationship among the VDH, VDFW, VAAFM and APHIS WS for the planning, coordination, and implementation of policies developed to prevent or minimize damage associated with wildlife, including threatened and endangered species, to agriculture, property, and natural resources and to safeguard public health and safety; (2) to facilitate exchange of information; (3) to encourage research on wildlife damage management; and (4) to provide a basis for the establishment of cooperative agreements to conduct wildlife damage management

activities. The mission of the VFWD is to protect and conserve our fish, wildlife, plants and their habitats for the people of Vermont. VFWD handles wildlife damage management problems involving black bear, deer, rabbit and fur-bearer species. The VFWD forwards citizens' request for migratory bird damage management to WS. The VFWD cosigns Federal depredation permits that authorize take of migratory game birds. WS and the VFWD cooperatively assist VT airports with wildlife hazard management issues related to mammals, such as white-tailed deer. The VFWD Non-game and Natural Heritage Program (NNP) administers programs related to non-game birds such as vultures and gulls, and conducts management and education programs for endangered, threatened, and non-game wildlife species.

Vermont Agency of Agriculture, Food & Markets, Plant Industry Division (VAAFM)

WS and the VAAFM currently has a signed MOU, which establishes a cooperative relationship among the VDH, VDFW, VAAFM and APHIS WS for the planning, coordination, and implementation of policies developed to prevent or minimize damage associated with wildlife, including threatened and endangered species, to agriculture, property, and natural resources and to safeguard public health and safety; (2) to facilitate exchange of information; (3) to encourage research on wildlife damage management; and (4) to provide a basis for the establishment of cooperative agreements to conduct wildlife damage management activities. The VAAFM Plant Industry Division (VPID) enforces state laws pertaining to the use and application of pesticides, including those related to the registration of pesticide products, licensing of private and commercial pesticide applicators, and licensing of pesticide businesses. The VPID implements regulations found in V.S.A. Title 6 Chapter 87, Sections 1101-1112. Pesticide products for bird damage control are registered through the VAAFM, Plant Industry Division by USDA APHIS WS and other entities (eg. pesticide manufacturers).

Vermont Department of Health (VDH)

WS and the VDH currently has a signed MOU, which establishes a cooperative relationship among the VDH, VDFW, VAAFM and APHIS WS for the planning, coordination, and implementation of policies developed to prevent or minimize damage associated with wildlife, including threatened and endangered species, to agriculture, property, and natural resources and to safeguard public health and safety; (2) to facilitate exchange of information; (3) to encourage research on wildlife damage management; and (4) to provide a basis for the establishment of cooperative agreements to conduct wildlife damage management activities. The VDH, VFWD and VAAFM currently has a cooperative agreement with WS, which establishes a cooperative relationship between WS and these agencies with responsibilities for resolving wildlife damage management situations when it concerns a rabies threat in Vermont. The VTDH provides technical guidance to WS on public health related issues and potential health problems associated with wildlife, and refers callers with wildlife damage related questions to WS.

USDA Forest Service

The Forest Service has the responsibility to manage the resources of federal lands for multiple uses including timber production, recreation and wildlife habitat, while recognizing the state's authority to manage wildlife populations. Although the state has jurisdiction for general wildlife populations, the Forest Service has the responsibility for threatened and endangered species in concert with the US Fish and Wildlife Service, as provided for in the Endangered Species Act. The Forest Service also retains the responsibility for sensitive wildlife species for which population viability on National Forest System lands is a concern. The Forest Service recognizes the importance of reducing wildlife damage on lands and resources under their jurisdiction, as integrated with their multiple use responsibilities. Occasionally, wildlife damage management actions may be taken on National Forest System lands to protect resources on adjacent properties. Authorization must be granted by the Green Mountain and Finger Lakes National Forest Supervisor's office, Rutland Vermont, before any wildlife damage management or disease

surveillance actions occur on National Forest System lands. Authorization may require additional environmental analysis under the National Environmental Policy Act at the project specific level.

1.8 COMPLIANCE WITH LAWS AND STATUTES

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

National Environmental Policy Act (NEPA)

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

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

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

The MBTA makes it unlawful to pursue, hunt, take, capture, kill, possess, import, export, transport, sell, purchase, barter, or offer for sale, purchase, or barter, any migratory bird, or their parts, nests, or eggs (16 USC 703-711). A list of bird species protected under the MBTA can be found in 50 CFR 10.13. The MBTA also provides the USFWS regulatory authority to protect families of migratory birds. The law prohibits any "*take*" of migratory bird species by any entities, except as permitted by the USFWS. Under permitting guidelines in the Act, the USFWS may issue depredation permits to requesters experiencing damage caused by bird species protected under the Act. Information regarding migratory bird permits can be found in 50 CFR 13 and 50 CFR 21. All actions analyzed in this EA would be conducted in compliance with the regulations of the MBTA, as amended.

The law was further clarified to include only those birds afforded protection from take in the United States by the Migratory Bird Treaty Reform Act of 2004. Under the Reform Act, the USFWS published a list of bird species not protected under the MBTA (70 FR 12710-12716). Free-ranging or feral domestic waterfowl, mute swans, ring-necked pheasants, wild turkeys, monk parakeets, rock pigeons, European starlings, and house sparrows are not protected from take under the MBTA. A permit from the USFWS to take those species is not required. However, a permit or authorization from the VFWD may be required to take those species.

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

Depredation Order for Canada Geese at Agricultural Facilities (50 CFR 21.51)

Under 50 CFR 21.51, the VFWD may authorize agricultural producers that are actively engaged in commercial agriculture to conduct and implement direct damage management activities including lethal and non-lethal strategies on resident Canada geese when the geese are committing depredation to agricultural crops and when necessary to resolve or prevent injury to agricultural crops or other agricultural interests from resident Canada geese. Management activities involving the take of resident geese may be conducted between May 1 and August 31 and the destruction of resident Canada geese nests and eggs may take place between March 1 and June 30.

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

The purpose of this depredation order is to reduce the occurrence and/or minimize the risk of adverse impacts to public resources (fish, including both free-swimming and hatchery stock at federal, state, and tribal facilities, wildlife, plants, and their habitats) caused by double-crested cormorants. This depredation order authorizes the VFWD, federally recognized tribes, and state directors of WS to prevent depredation of public resources by taking without a permit any double-crested cormorant committing or about to commit such act. Under this depredation order nonlethal control methods should be utilized first when they are considered effective and practicable and not harmful to other nesting birds.

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

Pursuant to the MBTA under 50 CFR 21.43, a depredation permit is not required to lethally take blackbirds when those species are found committing or about to commit depredations upon ornamental or shade trees, agricultural crops, livestock, or wildlife, or when concentrated in such numbers and manner as to constitute a health hazard or other nuisance (Sobeck 2010). Those bird species that can be lethally taken under the blackbird depredation order that are addressed in the assessment include American crows, fish crows, red-winged blackbirds, common grackles, boat-tailed grackles, and brown-headed cowbirds.

Control Order for Muscovy Ducks (50 CFR 21.54)

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

Bald and Golden Eagle Protection Act (16 USC 668)

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 eagle was proposed for removal from the ESA. The bald eagle was officially de-listed from the ESA on June 28, 2007 with the exception of the Sonora Desert bald eagle population. Although officially removed from the protection of the ESA across most of its range, the bald eagle is still afforded protection under the Bald and Golden Eagle Protection Act.

Under the Bald and Golden Eagle Protection Act (16 USC 668-668c), the take of bald eagles is prohibited without a permit from the USFWS. Under the Act, the definition of "*take*" includes actions that "*pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, destroy, molest, or disturb*" eagles. The regulations authorize the United States Fish and Wildlife Service to issue permits for the take of bald eagles and golden eagles on a limited basis (see 74 FR 46836-46837, 50 CFR 22.26, 50 CFR 22.27). As necessary, WS would apply for the appropriate permits as required by the Bald and Golden Eagle Protection Act.

Endangered Species Act (ESA)

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

Presently, WS has made a "no effect" determination regarding impacts to T&E species. If circumstances change, WS may consult with the USFWS to ensure the viability of T&E species.

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

The NHPA and its implementing regulations (36 CFR 800) require federal agencies to initiate the Section 106 process if an agency determines that the agency's actions are undertakings as defined in Sec. 800.16(y) and, if so, whether it is a type of activity that has the potential to cause effects on historic properties. If the undertaking is a type of activity that does not have the potential to cause effects on historic properties, assuming such historic properties were present, the agency official has no further obligations under Section 106. None of the bird damage management methods described in this EA that might be used under the alternatives causes major ground disturbance, any physical destruction or damage to property, any alterations of property, wildlife habitat, or landscapes, nor involves the sale, lease, or transfer of ownership of any property. In general, such methods also do not have the potential to introduce visual, atmospheric, or audible elements to areas in which they are used that could result in

effects on the character or use of historic properties. Therefore, the methods that could be used by WS under the proposed action are not generally the types of activities that would have the potential to affect historic properties. If an individual activity with the potential to affect historic resources is planned under an alternative selected as a result of a decision on this EA, the site-specific consultation as required by Section 106 of the NHPA would be conducted as necessary.

Noise-making methods, such as firearms, that are used at or in close proximity to historic or cultural sites for the purposes of hazing or removing nuisance wildlife have the potential for audible effects on the use and enjoyment of historic property. However, such methods would only be used at a historic site at the request of the owner or manager of the site to resolve a damage problem, which means the use of those methods 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 Section 106 of the NHPA would be conducted as necessary in those types of situations.

Environmental Justice - 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. Environmental justice is a priority within APHIS and WS. Executive Order 12898 requires federal agencies to make environmental justice part of their mission, and to identify and address disproportionately high and adverse human health and environmental effects of federal programs, policies, and activities on minorities and persons or populations of low income. APHIS implements Executive Order 12898 principally through its compliance with the NEPA. All WS' activities are evaluated for their impact on the human environment and compliance with Executive Order 12898. WS' personnel use only legal, effective, and environmentally safe wildlife damage management methods, tools, and approaches. It is not anticipated that the use of methods would result in any adverse or disproportionate environmental impacts to minorities and persons or populations of low income.

Protection of Children - Executive Order 13045

Children may suffer disproportionately for many reasons from environmental health and safety risks, including the development of their physical and mental status. Because WS makes it a high priority to identify and assess environmental health and safety risks that may disproportionately affect children, WS has considered the impacts that this proposal might have on children. 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.

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

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

Invasive Species - Executive Order 13112

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

The Native American Graves and Repatriation Act of 1990

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

Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)

The FIFRA requires the registration, classification, and regulation of all pesticides used in the United States. The EPA is responsible for implementing and enforcing the FIFRA. All chemical methods employed and/or recommended by the WS' program in Vermont pursuant to the alternatives would be registered with the EPA and VAAFM, when applicable. All chemical methods would be employed by WS pursuant to label requirements when providing direct operational assistance under the alternatives. In addition, WS would recommend that all label requirements be adhered to when recommending the using of chemical methods while conducting technical assistance projects under the alternatives.

New Animal Drugs for Investigational Use

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

Occupational Safety and Health Act of 1970

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

Vermont Wildlife Laws, Regulations and Policies Regarding Bird Damage Management

Vermont Statutes Annotated (V.S.A.) Title 10 contains fish, game, and wildlife law for the State of Vermont.

1. VSA 10:113 sec. 4902 Wild birds generally; no open season; exception. Wild birds, other than pigeons, shall not be taken, possessed, bought or sold, at any time, except as provided by

this part, rules of the board or orders of the commissioner. Birds coming from without the state belonging to the same family as those protected by this subchapter shall not be bought or sold.

2. VSA 10:113 sec. 4904 Use of light, snares, traps. A person shall not take a bird with the aid of a jack or other light. A person shall not take a wild bird by trapping, netting or snaring, or possess such a bird so taken, or set, place or use, where birds may be taken, a net trap or snare for taking bird. Such a net, trap or snare is hereby declared to be a public nuisance and may be summarily abated and destroyed by any person, and game wardens shall seize and destroy such devices. The commissioner, however, may authorize the taking of birds by nets or traps or other devices, under such regulations as he may prescribe.
3. VSA 10:113 sec. 4905 Birds' nests and eggs; destroying or robbing A person shall not take or willfully destroy the nests or eggs of wild birds, other than pigeons, the House sparrow, starling, or purple grackle, except when necessary to protect buildings or when taken as provided in section 4152 of this title.

Vermont regulations necessary to implement laws. Bird damage–related laws and regulations are summarized here.

1. Vermont currently does not have a statute pertaining to bird damage to agriculture, but instead VFWD adopts the provisions of Federal Depredation Order 50 CFR 21.43, a person may kill yellow-headed, red-winged, bi-colored red winged, tri-colored red-winged, and Brewer's blackbirds, cowbirds, all grackles, common crows and magpies when found committing or about to commit serious depredations upon any ornamental or shade tree, agricultural crops, livestock, or wildlife, or when concentrated in such numbers and manner as to constitute a health hazard or other nuisance.
2. VSA 10:113 sec. 4152 The Vermont Fish and Wildlife Department Commissioner may issue permits to a properly accredited person or educational institution permitting the holder thereof to collect birds, their nests and eggs, and fish and wild animals or parts thereof, for public scientific research or educational purposes of the institution. In addition, the Commissioner may issue a permit to an individual allowing the holder to collect fish and wild animals for the purpose of using them as subjects of art or photography. The Permittee is granted approval for scientific collection for the following purpose: Scientific Research. The Commissioner has determined that the Permittee has the required accreditation and proposed an activity consistent with the purposes set out under 10 VSA 4152

Vermont Pesticide Laws

Vermont's pesticide regulations, V.S.A. Title 6 Chapter 87, Section I-XIII, are implemented and enforced by the VAAFM Plant Industry Division (VPID). These regulations include processes and requirements for licenses, certificates and permits issued by the VAAFM (Section II), restrictions on the use and application of pesticides (Section IV), Maintenance of records by certified applicators, licensed companies, licensed pesticide dealers and pesticide producing establishments (Section V), company license (Section VI), requirements for certified commercial and certified noncommercial applicators (Section VII), certification standards for commercial applicators and noncommercial applicators using other than Class "C" pesticides (Section VIII), certification of private applicators (Section IX), classification of pesticides and limitations on sale (Section X), pesticide dealer licenses (Section XI), community right-to-know requirements and accident reporting (Section XII) and transportation, storage and disposal of pesticides (Section XIII). In order for WS to apply a restricted use pesticide as part of bird damage management in VT, the product must be registered with the VPID, the applicator must be certified and possess a VT pesticide applicator certificate. Additionally, label instructions, and all other pesticide and wildlife laws and regulations must be adhered to (e.g. possession of a depredation permit from the

USFWS and/or the VFWD to take the protected bird species). Pesticide products are registered annually, and applicator certificates are obtained and maintained through completion of training courses and examinations conducted through the VPID.

CHAPTER 2: AFFECTED ENVIRONMENT AND ISSUES

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

2.1 AFFECTED ENVIRONMENT

Bird damage or threats of damage can occur statewide wherever birds occur. However, bird damage management would only be conducted by WS when requested by a landowner or manager and only on properties where a cooperative service agreement or other comparable document has been signed between WS and a cooperating entity. Most species of birds addressed in this EA can be found throughout the year across the state where suitable habitat exists for foraging, loafing, roosting, and breeding. Since birds can be found throughout the state, requests for assistance to manage damage or threats of damage could occur in areas occupied by those bird species.

Upon receiving a request for assistance, the proposed action alternative or those actions described in the other alternatives could be conducted on private, federal, state, tribal, and municipal lands to reduce damages and threats associated with birds to agricultural resources, natural resources, property, and threats to human safety. The analyses in this EA are intended to apply to actions taken under the selected alternative that could occur in any locale and at any time within the analysis area. This EA analyzes the potential impacts of bird damage management and addresses activities in Vermont that are currently being conducted under a MOU or cooperative service agreement with WS where activities have been and currently are being conducted. This EA also addresses the impacts of bird damage management where additional agreements may be signed in the future.

Assistance requests to resolve bird damage could occur, but are not necessarily limited to, areas in and around commercial, industrial, public, and private buildings, facilities and properties and at other sites where birds may roost, loaf, feed, nest, or otherwise occur. Examples of areas where bird damage management activities could be conducted are: residential buildings, golf courses, athletic fields, recreational areas, swimming beaches, parks, corporate complexes, subdivisions, businesses, industrial parks, schools, agricultural areas, wetlands, restoration sites, cemeteries, public parks, bridges, industrial sites, urban/suburban woodlots, hydro-electric dam structures, reservoirs and reservoir shore lands, nuclear, hydro and fossil power plant sites, substations, transmission line rights-of-way, landfills, on ship fleets, military bases, or at any other sites where birds may roost, loaf, feed, or nest. Damage management activities could be conducted at agricultural fields, vineyards, orchards, farmyards, dairies, ranches, livestock operations, grain mills, and grain handling areas (e.g., railroad yards) where birds destroy crops, feed on spilled grains, or contaminate food products for human or livestock consumption. Additionally, activities could be conducted at airports and surrounding properties where birds represent a threat to aviation safety.

Environmental Status Quo

As defined by the NEPA implementing regulations, the "*human environment shall be interpreted comprehensively to include the natural and physical environment and the relationship of people with that environment*" (40 CFR 1508.14). Therefore, when a federal action agency analyzes its potential impacts on the "*human environment*", it is reasonable for that agency to compare not only the effects of the federal action, but also the potential impacts that occur or would occur 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 wildlife species.

Most native wildlife species are protected under state or federal law. For some bird species, harvest during the hunting season is regulated pursuant to the MBTA by the USFWS through the issuance of frameworks, that include the allowable length of hunting seasons, methods of removal, and allowed harvest which are implemented by the VFWD. Under the blackbird depredation order (50 CFR 21.43), blackbirds can be removed by any entity without a federal depredation permit when those species identified in the order are found committing or about to commit damage or posing a human safety threat. Pursuant to the MBTA, the USFWS can issue depredation permits to those entities experiencing damage associated with birds, when deemed appropriate. Wild birds, other than pigeons, shall not be taken, possessed, bought ,or sold, at any time, except as provided by this part, rules of the board or orders of the commissioner (10 V.S.A § 4902). Free-ranging or feral domestic waterfowl, European starlings, rock pigeons, mute swans, and English sparrows are not protected from removal under the MBTA and can be addressed without the need for a depredation permit from the USFWS, but do require a VFWD permit.

When a non-federal entity (e.g., agricultural producers, health agencies, municipalities, counties, private companies, individuals, or any other non-federal entity) takes an action to alleviate bird damage, the action is not subject to compliance with the NEPA due to the lack of federal involvement[7] 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 would be used, WS' involvement in the action would not affect the environmental status quo. 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. Since the lethal removal of birds can occur either without a permit if those species are non-native, during hunting seasons, under depredation orders, under control orders, or through the issuance of depredation permits by the USFWS and/or VFWD and since most methods for resolving damage are available to both WS and to other entities, WS' decision-making ability is restricted to one of three alternatives. WS can either provide technical assistance with managing damage with no direct involvement, take the action using the specific methods as decided upon by the non-federal entity, or take no action at which point the non-federal entity could take the action anyway either without a permit, during the hunting season, under depredation orders, under control orders, or through the issuance of a depredation permit by the USFWS and/or VFWD. Under those circumstances, WS would have virtually no ability to affect the environmental status quo since the action would likely occur in the absence of WS' direct involvement.

In some situations, however, certain aspects of the human environment may actually benefit more from WS' involvement than from a decision not to assist. For example, if a cooperator believes WS has greater expertise to manage damage when compared to other entities, WS' management activities may have less

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

of an impact on target and non-target species than if the non-federal entity conducted the action alone. The concern arises from those persons experiencing damage using methods that have no prior experience with managing damage or threats associated with birds. The lack of experience in bird behavior and damage management methods could lead to the continuation of damage, which could threaten human safety or could lead to the use of inappropriate methods in an attempt to resolve damage. WS' personnel are trained in the use of methods, which increases the likelihood that damage management methods are employed appropriately, which can increase effectiveness, humaneness, minimizes non-target removal, and reduces threats to human safety from those methods. Thus, in those situations, WS' involvement may actually provide some benefit to the human environment when compared to the environmental status quo in the absence of such involvement.

2.2 ISSUES ASSOCIATED WITH BIRD DAMAGE MANAGEMENT ACTIVITIES

Issues are concerns of the public and/or professional community raised regarding potential adverse effects that might occur from a proposed action. Such issues must be considered in the NEPA decision-making process. Issues related to managing damage associated with birds in Vermont were developed by WS in consultation with the USFWS and the VFWD. The EA will also be made available to the public for review and comment to identify additional issues.

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

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

A common issue when addressing damage caused by wildlife is the potential impact of management actions on the populations of target species. Methods available to resolve damage or threats to human safety are categorized into non-lethal and lethal methods. Non-lethal methods available can disperse or otherwise make an area unattractive to target species causing damage, which reduces the presence of those species at the site and potentially the immediate area around the site where non-lethal methods were employed. Lethal methods would result in local population reductions in the area where damage or threats were occurring. The number of target species that could be removed from the population using lethal methods under the alternatives would be dependent on the number of requests for assistance received, the number of individual birds involved with the associated damage or threat, and the efficacy of methods employed. Under certain alternatives, both non-lethal and lethal methods could be recommended, as governed by federal, state, and local laws and regulations.

The analysis for magnitude of impact on the populations of those species addressed in the EA would be based on a measure of the number of individuals killed from each species in relation to that species' abundance. Magnitude may be determined either quantitatively or qualitatively. Quantitative determinations would be based on population estimates, allowable harvest levels, and actual harvest data. Qualitative determinations would be based on population trends and harvest trend data, when available. Removal would be monitored by comparing the number killed with overall populations or trends in the population. All lethal removal of birds by WS would occur at the requests of a cooperator seeking assistance and only after the removal of those birds species has been permitted by the USFWS pursuant to the MBTA, when required.

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

Breeding Bird Survey (BBS)

Bird populations can be monitored by using trend data derived from data collected during the BBS. Under established guidelines, observers count birds at established survey points for a set duration along a pre-determined route, usually along a road. Routes are 24.5 miles long and are surveyed once per year 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. Surveys were started in 1966 and are conducted in June, which is generally considered as the period of time when those birds present at a location are likely breeding in the immediate area. The BBS is conducted annually in the United States, across a large geographical area, under standardized survey guidelines. The BBS is a large-scale inventory of North American birds coordinated by the United States Geological Survey, Patuxent Wildlife Research Center (Sauer et al. 2014). The BBS is a combined set of over 3,700 roadside survey routes primarily covering the continental United States and southern Canada. The primary objective of the BBS has been to generate an estimate of population change for all breeding birds. Populations of birds tend to fluctuate, especially locally, because of variable local habitat and climatic conditions. Trends can be determined using different population equations and tested to identify whether it is statistically significant.

Current estimates of population trends from BBS data are derived from hierarchical model analysis (Link and Sauer 2002, Sauer and Link 2011) and are dependent upon a variety of assumptions (Link and Sauer 1998). The statistical significance of a trend for a given species is also determined using BBS data (Sauer et al. 2014).

Christmas Bird Count (CBC)

The CBC is conducted in December and early January annually by numerous volunteers under the guidance of the National Audubon Society (NAS). The CBC reflects the number of birds frequenting a location during the winter months. 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 data can be used as an indicator of trends in the population of a particular bird species over time. Researchers have found that population trends reflected in CBC data tend to correlate well with those from censuses taken by more stringent means (NAS 2010).

Partners in Flight Landbird Population Estimate

The BBS data are intended for use in monitoring bird population trends, but it is also possible to use BBS data to develop a general estimate of the size of bird populations. Using relative abundances derived from the BBS, Rich et al. (2004) extrapolated population estimates for many bird species in North America as part of the Partners in Flight Landbird Population Estimate database. The Partners in Flight system involves extrapolating the number of birds in the 50 quarter-mile circles (total area/route = 10 mi^2) survey conducted during the BBS to an area of interest. The model used by Rich et al. (2004) makes assumptions on the detectability of birds, which can vary for each species. Some species of birds that are more conspicuous (visual and auditory) are more likely to be detected during bird surveys when compared to bird species that are more secretive and do not vocalize often. Information on the detectability of a species is combined to create a detectability factor, which may be combined with relative abundance data from the BBS to yield a population estimate (Rich et al. 2004). The Partners in Flight Science Committee (2013) updated the database in the past year to reflect current population estimates.

Bird Conservation Regions

Bird Conservation Regions are areas in North America that are characterized by distinct ecological habitats that have similar bird communities and resource management issues. Vermont lies within two bird conservation regions: the Atlantic Northern Forest (Bird Conservation Region 14) and the Champlain Valley lies with the Lower Great Lakes/St. Lawrence Plain (LGLSP)(Bird Conservation Region 13). The majority of the state lies within the Atlantic Northern Forest region.

The Atlantic Northern Forest region is characterized by varied terrain ranging from low coastal plains (including offshore islands) in Maine and the Maritime provinces to high Appalachian peaks (4,000-6,000 ft. [1,220-1830 m]) in the White Mountains, Green Mountains, and Adirondacks. The northeastern terminus of the Appalachian Mountains is in northern New Brunswick, with only a few peaks reaching 2,500 ft. (750 m) in that area. Most of the Atlantic Northern Forest BCR, however, is low-mountainous or open hilly country, interspersed with valleys and plains. The BCR collectively contains over 3 million acres (1.2 million ha) of open freshwater habitat. The region also contains some relatively large areas of farmland in the Connecticut, Androscoggin, Kennebec, Penobscot, St. John, and Miramichi River valleys, as well as on Prince Edward Island. The most predominant general forest types include spruce-fir conifer, northern hardwood, and mixed deciduous-coniferous forests. Spruce-fir forests are typical of mountaintops and higher elevations in the Adirondack Mountains, Green Mountains, White Mountains, and the Gaspe Peninsula, as well as the interior portions of Maine and New Brunswick including lowland areas with poor soils or with boggy or swampy conditions. Maritime spruce-fir communities also occur in eastern Maine, Nova Scotia, and northern New Brunswick. This region encompasses a geographic area stretching southwest to northeast from the Taconic Hills of eastern New York/western Massachusetts and the Adirondack Mountains (cut off from the remainder of the BCR by the Lake Champlain valley), through most of Vermont, New Hampshire and Maine, Quebec south of the St. Lawrence River including the Gaspe Peninsula, and all of the Maritime provinces of New Brunswick, Prince Edward Island, and Nova Scotia.

The Lower Great Lakes/St. Lawrence Plain (LGLSP) region encompasses the low-lying areas south of the Canadian Shield including a small part of Vermont, New York, Pennsylvania and Ohio. This area includes agriculture and grassland habitat along with wetlands and lakeshore habitat.

Atlantic Flyway Breeding Waterfowl Plot Survey

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

Annual Harvest Estimates

The populations of several migratory bird species are sufficient to allow for annual harvest seasons that typically occur during the fall migration periods of those species. Migratory bird hunting seasons are established under frameworks developed by the USFWS and implemented by the VFWD. Those species addressed in this EA that have established hunting seasons include Canada geese, black duck, snow geese,

wood ducks, mallards, wild turkeys, woodcock, snipe, ruffed grouse, pheasant, brant, scaup, pintails, canvasbacks and American crows.

For crows, removal can also occur under the blackbird depredation order established by the USFWS pursuant to the MBTA. Therefore, the removal of crows can occur during annual hunting seasons and under the blackbird depredation order that allows crows to be removed to alleviate damage and to alleviate threats of damage. For many migratory bird species considered harvestable during a hunting season, the number of birds harvested during the season is reported by the USFWS and/or the VFWD in published reports.

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

A common issue when addressing damage caused by wildlife are the potential impacts of management actions on non-target species, including threatened and endangered species. Methods available to resolve damage or threats of damage can be categorized as lethal and non-lethal. Non-lethal methods disperse or otherwise make an area where damage is occurring unattractive to the species (target species) causing the damage, thereby reducing the presence of those species in the area. However, non-lethal methods also have the potential to inadvertently disperse non-target wildlife. Lethal methods remove individuals of the species (target 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 non-target wildlife.

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 Act 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 National Marine Fisheries Service) 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. Presently, WS has made a "no effect" determination regarding impacts to T&E species. If circumstances change, WS may consult with the USFWS to ensure the viability of T&E species.

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

An additional issue often raised is the potential risks associated with employing methods to manage damage caused by target species. Both chemical and non-chemical methods have the potential to have adverse effects on human safety. Risks can occur to persons employing methods and to persons coming into contact with methods. Risks can be inherent to the method itself or related to the misuse of the method.

Safety of Chemical Methods Employed

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

Several avian repellents are commercially available to disperse birds from an area or discourage birds from feeding on desired resources. Avitrol is an avian repellent available for use to manage damage associated with several bird species. For those species addressed in this assessment, Avitrol is available to manage damage associated with European starlings, house sparrows, and feral pigeons. Other repellents are also available with the most common ingredients being polybutene, anthraquinone, and methyl anthranilate. However, the restricted use pesticide, Starlicide®, is similar to DRC-1339 and may be used by certified applicators if it becomes registered for use in the state. Avitrol® could also be used by state certified restricted-use pesticide applicators.

Alpha-chloralose, a sedative, is also being considered as a method that could be employed under the alternatives to manage damage associated with waterfowl. Alpha-chloralose could be used to sedate waterfowl temporarily and lessen stress on the animal from handling and transportation from the capture site. Drugs delivered to immobilize waterfowl would occur on site with close monitoring to ensure proper care of the animal. Alpha-chloralose is fully reversible with a full recovery of sedated animals occurring.

Chemical methods are further discussed in Appendix B of this EA. The use of chemical methods is regulated by the EPA through the FIFRA, the VAAFM, by the FDA, and by WS Directives.

Safety of Non-Chemical Methods Employed

Most methods available to alleviate damage and threats associated with birds are considered non-chemical methods. Non-chemical methods employed to reduce damage and threats to safety caused by birds, if misused, could potentially be hazardous to human safety. Non-chemical methods are also discussed in detail in Appendix B. Many of the non-chemical methods are only activated when triggered by attending personnel (e.g., cannon nets, firearms, pyrotechnics, lasers, remote control vehicles), are passive live-capture methods (e.g., walk-in style live-traps, mist nets), or are passive harassment methods (e.g., effigies, exclusion, anti-perching devices, electronic distress calls).

The primary safety risk of most non-chemical methods occurs directly to the applicator or those persons assisting the applicator. However, risks to others do exist when employing non-chemical methods, such as when using firearms, cannon nets, or pyrotechnics. Most of the non-chemical methods available to address bird damage in Vermont would be available for use under any of the alternatives and could be employed by any entity, when permitted. Risks to human safety from the use of non-chemical methods will be further evaluated as this issue relates to the alternatives in Chapter 4.

Issue 4 - Effects on the Aesthetic Values of Birds

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

The human attraction to animals has been well documented throughout history and started when humans began domesticating animals. The American public shares a similar bond with animals and/or wildlife in general and in modern societies, large percentages of households have indoor or outdoor pets. However, some people may consider individual wild animals and birds as "*pets*" or exhibit affection toward those animals, especially people who enjoy viewing wildlife. Therefore, the public reaction is variable and

mixed to wildlife damage management because there are numerous philosophical, aesthetic, and personal attitudes, values, and opinions about the best ways to manage conflicts/problems between humans and wildlife.

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

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

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

2.3 ISSUES CONSIDERED BUT NOT IN DETAIL WITH RATIONALE

Additional issues were identified by WS and the USFWS during the scoping process of this EA. Those issues were considered by WS and the USFWS; however, those issues will not be analyzed in detail for the reasons provided.

Appropriateness of Preparing an EA (instead of an EIS) for Such a Large Area

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

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

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

WS' Impact on Biodiversity

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

Humaneness of Methods to be Employed

Humaneness, in part, is a person's perception of harm or pain inflicted on an animal, and people may perceive the humaneness of an action differently. The issue of humaneness and animal welfare, as it relates to the killing or capturing of wildlife, is an important and very complex concept that can be interpreted in a variety of ways. Schmidt (1989) indicated that vertebrate pest 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 is described as a " . . . highly unpleasant emotional response usually associated with pain and distress." However, suffering " . . . can occur without pain . . . ," and "... pain can occur without suffering . . ." (American Veterinary Medical Association (AVMA) 2013). Because suffering carries with it the implication of a time frame, a case could be made for " . . . little or no suffering where death comes immediately . . ." (CDFG 1991), such as shooting.

Pain obviously occurs in animals, but assessing pain experienced by animals can be challenging (AVMA 2007, CDFG 1991). The AVMA defines pain as being, "that sensation (perception) that results from nerve impulses reaching the cerebral cortex via ascending neural pathways" (AVMA 2013). The key component of this definition is the perception of pain. The AVMA (2013) notes that "pain" should not be used for stimuli, receptors, reflexes, or pathways because these factors may be active without pain perception. For pain to be experienced, the cerebral cortex and subcortical structures must be functional. If the cerebral cortex is nonfunctional because of hypoxia, depression by drugs, electric shock, or concussion, pain is not experienced.

The AVMA states "... euthanasia is the act of inducing humane death in an animal" and that "...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 terms such as killing, collecting, or harvesting, recognizing that a distress- free death may not be possible" (AVMA 2001).

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."

Vermont WS personnel are experienced and professional in their use of management methods so that they are as humane as possible under the constraints of current technology and funding. SOPs (Section 3.3) used to maximize humaneness are listed in this EA. As appropriate, WS euthanizes live animals by methods recommended by the AVMA (2013) or the recommendations of a veterinarian, even though the AVMA euthanasia methods were developed principally for companion animals and slaughter of food animals, and not for free-ranging wildlife. Due to the status quo definition, animals will be removed from the environment even with the absence of WS operations. Therefore, WS' professional involvement would ensure that most humane methods are utilized.

WS and the National Wildlife Research Center (NWRC) are striving to bring additional non-lethal damage management alternatives into practical use and to improve the selectivity and humaneness of management devices. Until new findings and products are found practical, a certain amount of animal suffering could occur when some methods are used in situations when non-lethal damage management methods are not practical or effective. WS supports the most humane, selective, and effective damage management techniques, and would continue to incorporate advances into program activities.

A Loss Threshold should be Established before Allowing Lethal Methods

One issue identified through WS' implementation of the NEPA processes is a concern that a threshold of loss should be established before employing lethal methods to resolve damage and that wildlife damage should be a cost of doing business. Some damage and economic loss can be tolerated by cooperators until the damage reaches a threshold where damage becomes an economic burden. The appropriate level of allowed tolerance or threshold before employing lethal methods would differ among cooperators and

damage situations. In addition, establishing a threshold would be difficult or inappropriate to apply to human health and safety situations.

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

Bird Damage Management should not occur at Taxpayer Expense

An issue previously identified is the concern that wildlife damage management should not be provided at the expense of the taxpayer or that activities should be fee-based. Funding for damage management activities would be derived from federal appropriations and through cooperative funding. Activities conducted for the management of damage and threats to human safety from birds would be funded through cooperative service agreements with individual property owners or managers. WS' funds to implement wildlife damage management activities and programs are derived from a number of sources, including, but not limited to federal, state, county and municipal governments/agencies, private organizations, corporations and individuals, homeowner/property owner associations, and others, under Cooperative Service Agreements and/or other contract documents and processes.

Cost Effectiveness of Management Methods

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

Bird Damage should be Managed by Private Nuisance Wildlife Control Agents

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

Effects from the Use of Lead Ammunition in Firearms

Questions have arisen about the deposition of lead into the environment from ammunition used in firearms to lethally remove birds. As described in Appendix B, the lethal removal of birds with firearms by WS to alleviate damage or threats would occur using a rifle or shotgun. In an ecological risk

assessment of lead shot exposure in non-waterfowl birds, ingestion of lead shot was identified as the concern rather than just contact with lead shot or lead leaching from shot in the environment (Kendall et al. 1996). To address lead exposure from the use of shotguns, the standard conditions of depredation permits issued by the USFWS pursuant to the MBTA for the lethal removal of birds requires the use of non-toxic shot. To alleviate concerns associated with lead exposure in wildlife, WS would only use non-toxic shot as defined in 50 CFR 20.21(j) when using shotguns to remove all birds.

The removal of birds by WS would occur primarily from the use of shotguns. However, the use of rifles could be employed to lethally remove some species. Birds that were removed using rifles would occur within areas where retrieval of all bird carcasses for proper disposal would be highly likely (e.g., at roost sites). With risks of lead exposure occurring primarily from ingestion of lead shot and bullet fragments, the retrieval and proper disposal of bird carcasses would greatly reduce the risk of scavengers ingesting or being exposed to lead that may be contained within the carcass.

However, deposition of lead into soil could occur if, during the use of a rifle, the projectile passes through a bird, if misses occur, or if the bird carcass is not retrieved. Laidlaw et al. (2005) reported that, because of the low mobility of lead in soil, all of the lead that accumulates on the surface layer of the soil is generally retained within the top 20 cm (about 8 inches). In addition, concerns occur that lead from bullets deposited in soil from shooting activities could lead to contamination of either ground water or surface water from runoff. Stansley et al. (1992) studied lead levels in water that was subjected directly to high concentrations of lead shot accumulation because of intensive target shooting at several shooting ranges. Lead did not appear to "*transport*" readily in surface water when soils were neutral or slightly alkaline in pH (i.e., not acidic), but lead did transport more readily under slightly acidic conditions. Although Stansley et al. (1992) detected elevated lead levels in water in a stream and a marsh that were in the shot "*fall zones*" at a shooting range, the study did not find higher lead levels in a lake into which the stream drained, except for one sample collected near a parking lot. Stansley et al. (1992) believed the lead contamination near the parking lot was due to runoff from the lot, and not from the shooting range areas. The study also indicated that even when lead shot is highly accumulated in areas with permanent water bodies present, the lead does not necessarily cause elevated lead contamination of water further downstream. Muscle samples from two species of fish collected in water bodies with high lead shot accumulations had lead levels that were well below the accepted threshold standard of safety for human consumption (Stansley et al. 1992).

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

Since the harvest of birds can occur during regulated hunting seasons, through the issuance of depredation permits, under depredation orders without the need to obtain a depredation permit, or are considered non-native with no depredation permit required for removal, WS' assistance with removing birds would not be additive to the environmental status quo. WS' assistance would not be additive to the environmental status quo since those birds removed by WS using firearms could be lethally removed by the entities experiencing damage using the same method in the absence of WS' involvement. The amount of lead

deposited into the environment may be lowered by WS' involvement in damage management activities due to efforts by WS to ensure projectiles do no pass through, but are contained within, the bird carcass, which limits the amount of lead potentially deposited into soil from projectiles passing through the carcass. The proficiency training received by WS' employees in firearm use and accuracy increases the likelihood that birds are lethally removed humanely in situations that ensure accuracy and that misses occur infrequently, which further reduces the potential for lead to be deposited in the soil from misses or from projectiles passing through carcasses. In addition, WS' involvement ensures bird carcasses lethally removed using firearms would be retrieved and disposed of properly to limit the availability of lead in the environment and ensures bird carcass would be removed from the environment to prevent the ingestion of lead in carcasses by scavengers. Based on current information, the risks associated with lead bullets that could be deposited into the environment from WS' activities due to misses, the bullet passing through the carcass, or from bird carcasses that may be irretrievable would be below any level that would pose any risk from exposure or significant contamination of water.

Global Climate Change/Greenhouse Gas Emissions

The WS program activities that may result from the alternatives would have a negligible effect on atmospheric conditions including the global climate. Meaningful direct or indirect emissions of greenhouse gases would not occur as a result of the proposed action. The proposed action would meet requirements of applicable federal laws, regulations, and Executive Orders including the Clean Air Act and Executive Order 13514.

CHAPTER 3: ALTERNATIVES

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

3.1 DESCRIPTION OF THE ALTERNATIVES

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

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

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

The adaptive approach to managing damage associated with birds would integrate the use of the most practical and effective methods to resolve a request for damage management as determined by site-specific evaluation to reduce damage or threats to human safety for each request after applying the WS Decision Model. City/town managers, agricultural producers, property owners, and others requesting

assistance would be provided information regarding the use of appropriate non-lethal and lethal techniques. WS would work with those persons experiencing bird damage in addressing those birds responsible for causing damage as expeditiously as possible. To be most effective, damage management activities should begin as soon as birds begin to cause damage. Bird damage that has been ongoing can be difficult to resolve using available methods since birds are conditioned to feed, roost, loaf, and are familiar with a particular location. Subsequently, making that area unattractive using available methods can be difficult to achieve once damage has been ongoing. The USFWS could continue to issue depredation permits to WS and to those entities experiencing bird damage when requested by the entity and when deemed appropriate by the USFWS for those species that require a permit.

Under this alternative, WS could respond to requests for assistance by: 1) taking no action, if warranted, 2) providing only technical assistance to property owners or managers on actions they could take to reduce damages caused by birds, or 3) providing technical assistance and direct operational assistance to a property owner or manager experiencing damage. The removal of birds can only legally occur as authorized by the VFWD, and through the issuance of a depredation permit by the USFWS and only at levels specified in the permit, unless those bird species are afforded no protection under the MBTA or a depredation/control order has been established by the USFWS in which case no permit for removal is required. When applying for a depredation permit, the requesting entity submits with the application the number of birds requested to be taken to alleviate the damage. Therefore, under this alternative, the USFWS could: 1) deny an application for a depredation permit when requested to alleviate bird damage, 2) could issue a depredation permit at the removal levels requested, or 3) could issue permits at levels below those removal levels requested.

Property owners or managers may choose to implement WS' recommendations on their own (i.e., technical assistance), use contractual services of private businesses, use volunteer services of private organizations, use the services of WS (i.e., direct operational assistance), or take no action.

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

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

In anticipation of damage management activities, WS would annually submit an application for a depredation permit to the USFWS estimating the maximum number of birds that could be lethally removed to alleviate damage through direct operational assistance projects. The number of birds anticipated to be lethally removed by WS would be based on previous requests for assistance received to

manage damage associated with those species of birds. Therefore, the USFWS could: 1) deny WS' application for a depredation permit, 2) issue a depredation permit for the removal of birds at a level below the number requested by WS, or 3) issue a depredation permit for the number of birds requested by WS. In addition, WS could be listed as subpermittees under depredation permits issued to other entities.

Non-lethal methods include, but are not limited to, habitat/behavior modification, nest/egg destruction, lure crops, visual deterrents, live traps, translocation, exclusionary devices, frightening devices, alpha-chloralose, reproductive inhibitors, and chemical taste repellents (see Appendix B for a complete list and description of potential methods). Lethal methods considered by WS include live-capture followed by euthanasia, DRC-1339, the recommendation of harvest during hunting seasons, and firearms. WS would employ cervical dislocation or carbon dioxide to euthanize target birds once those birds were live-captured using other methods. Carbon dioxide is an acceptable form of euthanasia for birds while cervical dislocation is a conditionally acceptable[8] method of euthanasia (AVMA 2013). The use of firearms could also be used to euthanize birds live-captured; however, the use of firearms for euthanasia is considered a conditionally acceptable method for wildlife (AVMA 2013).

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

Integrated Wildlife Damage Management (IWDM)

The most effective approach to resolving wildlife damage is to integrate the use of several methods simultaneously or sequentially. The philosophy behind IWDM is to implement the best combination of effective management methods in the most cost-effective manner while minimizing the potentially harmful effects on humans, target and non-target species, and the environment. IWDM may incorporate cultural practices (e.g., animal husbandry), 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.

Technical Assistance Recommendations

The WS program in Vermont regularly provides technical assistance to individuals, organizations, and other federal, state, and local government agencies for managing bird damage. Technical assistance includes collecting information about the species involved, the nature and extent of the damage, and previous methods that the cooperator has attempted to resolve the problem. WS then provides information on appropriate methods that the cooperator may consider to resolve the damage themselves. Types of technical assistance projects may include a visit to the affected property, written communication, telephone conversations, or presentations to groups such as homeowner associations or civic leagues

Operational Damage Management Assistance

Operational damage management assistance includes damage management activities that are directly conducted by or supervised by personnel of WS. Operational damage management assistance may be initiated when the problem cannot effectively be resolved through technical assistance alone and there is a written MOU, cooperative service agreement, or other comparable document between WS and the entity

[8]The AVMA (2013) defines conditional acceptable as "...[methods] *that by the nature of the technique or because of greater potential for operator error or safety hazards might not consistently produce humane death or are methods not well documented in the scientific literature".*

requesting assistance. The initial investigation defines the nature, history, and extent of the problem; species responsible for the damage; and methods available to resolve the problem. The professional skills of WS' personnel are often required to resolve problems, especially if restricted-use chemicals are necessary or if the problems are complex.

To address the anticipated needs of property owners/managers with bird damages that may request WS' assistance with lethal methods to alleviate their damages, WS would submit an application for a one-year depredation permit to the USFWS estimating the maximum number of birds of each species to be lethally removed as part of an integrated approach. The USFWS would conduct an independent review of the application, and if acceptable, issue a permit as allowed under the depredation permit regulations. WS could request an amendment of their permit to increase the number of birds that could be removed to address unpredicted and emerging bird damages/conflicts. Each year, WS would submit an application for renewal of their permit, and using adaptive management principles, would adjust numbers of birds to meet anticipated needs, based upon management actions in the previous year and anticipated damages and conflicts in the next year. The USFWS would review these applications annually, and issue permits as allowed by regulations. All alterations in the number of birds to be removed would be checked against the impacts analyzed in this EA. All management actions by WS would comply with appropriate federal, state, and local laws.

Educational Efforts

Education is an important element of activities 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 routine dissemination of recommendations and information to individuals or organizations sustaining damage, WS provides lectures, courses, and demonstrations to producers, homeowners, state and county agents, colleges and universities, and other interested groups. Cooperating agencies frequently collaborate with other entities in education and public information efforts. Additionally, technical papers are presented at professional meetings and conferences so that other wildlife professionals and the public are periodically updated on recent developments in damage management technology, programs, laws and regulations, and agency policies.

Research and Development

The National Wildlife Research Center (NWRC) functions as the research arm of WS by providing scientific information and development of methods for wildlife damage management that are effective and environmentally responsible. Research biologists with the NWRC work closely with wildlife managers, researchers, and others to develop and evaluate damage management techniques. For example, research biologists from the NWRC were involved with developing and evaluating mesurol for reducing crow predation on eggs. NWRC biologists have authored hundreds of scientific publications and reports, and are respected worldwide for their expertise in wildlife damage management.

WS' Decision Making Procedures

WS' personnel use a thought process for evaluating and responding to damage complaints that is depicted by the WS Decision Model (Figure 3.1) and described by Slate et al. (1992). WS' personnel are frequently contacted after requesters have tried or considered non-lethal methods and found them to be impractical, too costly, or inadequate for effectively reducing damage. WS' personnel assess the problem and then evaluate the appropriateness and availability (legal and administrative) of strategies and methods based on biological, economic, and social considerations. Following this evaluation, methods deemed practical for the situation would be incorporated into a damage management strategy. After this strategy had been implemented, monitoring would be conducted and evaluation would continue to assess the effectiveness of the strategy. If the strategy were effective, no further management would be needed. In terms of the WS Decision Model, most efforts to manage damage consist of continuous feedback between receiving the request and monitoring the results of the damage management strategy. The WS Decision Model is not a written documented process, but a mental problem-solving process common to most, if not all, professions, including WS.

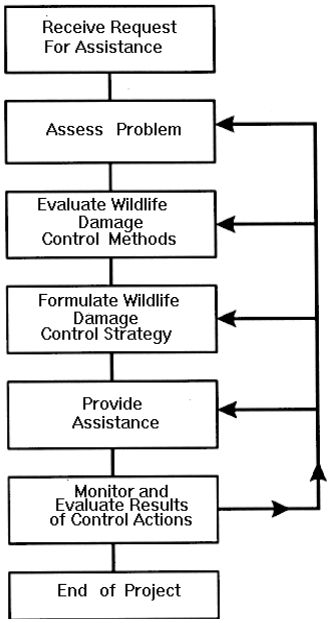

Figure 3.1 WS Decision Model as presented by Slate et al. (1992) for developing a strategy to respond to a request for assistance with human-wildlife conflicts.

Community-based Decision Making

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

By involving decision-makers in the process, damage management actions can be presented to allow decisions to involve those individuals that the decision-maker(s) represents. Requests for assistance to manage birds often originate from the decision-maker(s) based on community feedback or from concerns about damage or threats to human safety. As representatives, the decision-maker(s) are able to provide the information to local interests either through technical assistance provided by WS or through demonstrations and presentations by WS on activities to manage damage. This process allows decisions on activities to be made based on local input.

Alternative 2 - Bird Damage Management by WS using only Non-lethal Methods

Under this alternative, WS would be restricted to only using or recommending non-lethal methods to resolve damage caused by birds in Vermont (Appendix B). Lethal methods could continue to be used under this alternative by those persons experiencing damage without involvement by WS. In situations where non-lethal methods were impractical or ineffective to alleviate damage, WS could refer requests for information regarding lethal methods to the state, local animal control agencies, or private businesses or organizations. Property owners or managers may choose to implement WS' non-lethal recommendations on their own or with the assistance of WS, implement lethal methods on their own, or request assistance (non-lethal or lethal) from a private or public entity other than WS

Alternative 3 – No Bird Damage Management Conducted by WS

This alternative precludes any activities by WS to reduce threats to human health and safety, and alleviate damage to agricultural resources, property, and natural resources. WS would not be involved with any aspect of bird damage management. All requests for assistance received by WS to resolve damage caused by birds would be referred to the USFWS, the VFWD, and/or private entities. This alternative would not deny other federal, state, and/or local agencies, including private entities from conducting damage management activities directed at alleviating damage and threats associated with birds. Many of the methods listed in Appendix B would be available for use by other agencies and private entities, unless otherwise noted in the Appendix, to manage damage and threats associated with birds. Additionally, WS would not be able to fulfill its obligations listed under the CSA with the VFWD.

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

Despite no involvement by WS in resolving damage and threats associated with birds, those persons experiencing damage caused by birds could continue to resolve damage by employing those methods legally available since the removal of birds could occur either through the issuance of depredation permits by the USFWS; harvest during the hunting seasons, and blackbirds could be removed at any time when found committing or about to commit damage or posing a human safety threat under a depredation order; Muscovy ducks could be removed under the control order, and non-native bird species could be removed without the need for a depredation permit issued by the USFWS. All methods described in Appendix B would be available for use by those persons experiencing damage or threats except for the use of alpha-chloralose for waterfowl, DRC-1339 for blackbirds and gulls, which can only be used by WS.

3.2 ALTERNATIVES CONSIDERED BUT NOT ANALYZED IN DETAIL WITH RATIONALE

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

Use of Non-lethal Methods before Lethal Methods

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

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

Use of Lethal Methods Only by WS

This alternative would require the use of lethal methods only to reduce threats and damage associated with birds. However, non-lethal methods can be effective in preventing damage in certain instances. Under WS Directive 2.101, WS must consider the use of non-lethal methods before lethal methods. Therefore, this alternative was not considered in detail.

Trap and Translocate Birds Only

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

The translocation of birds, that have caused damage to other areas following live-capture, generally would not be effective or cost-effective. Translocation is generally ineffective because problem bird species are highly mobile and can easily return to damage sites from long distances, habitats in other areas are generally already occupied, and translocation would most likely result in bird damage problems at the new location. In addition, hundreds or thousands of birds would need to be captured and translocated to solve some damage problems (e.g., urban blackbird roosts); therefore, translocation would be unrealistic. Translocation of wildlife is also discouraged by WS policy (WS Directive 2.501) because of the stress to the translocated animal, poor survival rates, and the difficulties that translocated wildlife have with adapting to new locations or habitats (Nielsen 1988).

Compensation for Bird Damage

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

Technical Assistance Only

This alternative would restrict WS to only providing technical assistance (advice) on BDM. Producers, property owners, agency personnel, or others could obtain permits from the USFWS and/or the VFWD as needed and could conduct bird damage management using any of the legally available non-lethal and lethal techniques. Technical assistance information is also readily available from entities other than WS such as the USFWS, universities, extension agents, FAA, and private individual and organizations. Environmental impacts of this alternative are likely to be similar to Alternative 3. Consequently, the agencies have determined that detailed analysis of this alternative would not contribute substantive new information to the understanding of environmental impacts of damage management alternatives and have chosen to not analyze this alternative in detail.

3.3 STANDARD OPERATING PROCEDURES FOR BIRD DAMAGE MANAGEMENT

SOPs improve the safety, selectivity, and efficacy of those methods available to resolve or prevent damage. The current WS program uses many such SOPs. Those SOPs would be incorporated into activities conducted by WS when addressing bird damage and threats.

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

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

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

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

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

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

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

- Management actions would be directed toward specific birds posing a threat to human safety, causing agricultural damage, causing damage to natural resources, or causing damage to property.

- The removal of birds would only occur when authorized by the USFWS and/or VFWD, when applicable, and only at levels authorized.

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

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

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

3.4 ADDITIONAL STANDARD OPERATING PROCEDURES SPECIFIC TO THE ISSUES

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

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

- Lethal removal of birds by WS would be reported and monitored by WS and by the USFWS to evaluate population trends and the magnitude of WS' removal of birds in the state.

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

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

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

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

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

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

- 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 non-target animal captures.

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

- Carcasses of birds retrieved after damage management activities have been conducted would be disposed of in accordance with WS Directive 2.515, including any permits required by the USFWS and VFWD.

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

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

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

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

- Damage management via shooting would be conducted during times when public activity and access to the control areas are restricted. Personnel involved in shooting operations would be fully trained in the proper and safe application of this method.

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

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

- Carcasses of birds retrieved after damage management activities would be disposed of in accordance with WS Directive 2.515, including any permits required by the USFWS and VFWD.

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

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

Issue 4 - Effects on the Aesthetic Values of Birds

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

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

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

CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

Chapter 4 provides information needed for making informed decisions in selecting the appropriate alternative to address the need for action described in Chapter 1 and the issues described in Chapter 2. This chapter analyzes the environmental consequences of each alternative as those alternatives relate to the issues identified. The following resource values are not expected to be significantly impacted by any of the alternatives analyzed: soils, geology, minerals, water quality/quantity, flood plains, wetlands, visual resources, air quality, prime and unique farmlands, aquatic resources, timber, and range. Those resources will not be analyzed further.

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

Indirect Effects: These are impacts caused by an action that are later in time or farther 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 that 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.

4.1 ENVIRONMENTAL CONSEQUENCES FOR ISSUES ANALYZED IN DETAIL

The proposed action/no action alternative serves as the baseline for the analysis and the comparison of expected impacts among the alternatives. The analysis also takes into consideration mandates, directives, and the procedures of WS, the USFWS, and the VFWD.

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

Population Impact Analyses of the Alternatives

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

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

Under the proposed action, WS would continue to provide both technical assistance and direct operational assistance using methods described in Appendix B to those persons requesting assistance with managing damage and threats associated with birds. WS' lethal removal is monitored by comparing numbers of animals killed with overall populations or trends in populations to assure the magnitude of removal is maintained below the level that would cause significant adverse impacts to the viability of native species' populations. The potential impacts on the populations of target bird species from the implementation of the proposed action are analyzed for each species below. Unless noted otherwise, the state population estimate listed for each species analyzed below was obtained from PFSC (2013). Breeding Bird Survey (BBS) population trends from 1966 to 2013 for Vermont and the BCR regions that the state falls within two bird conservation regions: the Atlantic Northern Forest (Bird Conservation Region 14) and the Champlain Valley lies with the Lower Great Lakes/St. Lawrence Plain (LGLSP) (Bird Conservation Region 13). The statistical significance of a trend for a given species that is determined by the BBS data is color coded: a black percentage indicates a statistically non-significant positive or negative trend, a red percentage indicates a statistically significant negative trend, and a blue percentage indicates a statistically significant positive trend (Sauer et al. 2014).

Non-lethal methods can disperse or otherwise make an area unattractive to birds causing damage; thereby, reducing the presence of birds at the site and potentially the immediate area around the site where non-lethal methods are employed. Non-lethal methods would be given priority when addressing requests for assistance (WS Directive 2.101). However, non-lethal methods would not necessarily be employed or recommended to resolve every request for assistance if deemed inappropriate by WS' personnel using the WS Decision Model. For example, if a cooperator requesting assistance has already used non-lethal methods, WS would not likely recommend or continue to employ those particular methods since their use has already been proven ineffective in adequately resolving the damage or threat.

Many non-lethal methods are used to excluded, harass, and disperse target wildlife from areas where damage or threats are occurring. When effective, non-lethal methods would disperse birds from the area resulting in a reduction in the presence of those birds at the site where those methods were employed. However, birds responsible for causing damage or threats are moved to other areas with minimal impact on those species' populations. Non-lethal methods are not employed over large geographical areas or applied at such intensity that essential resources (*e.g.*, food sources, habitat) would be unavailable for extended durations or over a wide geographical scope that long-term adverse effects would occur to a species' population. Non-lethal methods are generally regarded as having minimal impacts on overall populations of wildlife since individuals of those species are unharmed. The use of non-lethal methods would not have adverse impacts on bird populations in the state under any of the alternatives.

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

WS may recommend birds be harvested during the regulated hunting and/or trapping season for those species in an attempt to reduce the number of birds causing damage. Managing bird populations over broad areas could lead to a decrease in the number of birds causing damage. Establishing hunting and trapping seasons and the allowed take during those seasons is the responsibility of the VFWD. WS does

not have the authority to establish hunting or trapping seasons or to set allowed harvest numbers during those seasons. However, the harvest of those birds with hunting and/or trapping seasons would be occurring in addition to any take that could occur by WS under the alternatives or recommended by WS.

Generally, WS only conducts damage management on species whose population densities are high or concentrated and usually only after they have caused damage. No indirect effects were identified for this issue. The issue of the potential impacts of conducting the alternatives on the populations of those target bird species addressed in this EA is analyzed for each alternative below.

American Black Duck Biology and Population Impacts

VT population estimate: Unknown
BBS Atlantic Northern Forest, 1966-2013: 0.35%
BBS Atlantic Northern Forest, 2003-2013: 0.82%
BBS LGLSP, 1966-2013: -3.87%
BBS LGLSP, 2003-2013: -2.62%

WS proposed removal: 100 + 50 nests (and eggs)
BBS VT, 1966-2013: -6.20%
BBS VT, 2003-2013: -5.97%

Black ducks can be found year-round in Vermont (Longcore et al. 2000). Black duck habitat includes brushy and woody wetlands, and marshes or slow flowing streams surrounded by woods (Longcore et al. 2000). The current number of black ducks observed in the state during the Atlantic Flyway Breeding Waterfowl Survey conducted in 2013 and 2014 is unknown. Black ducks can be harvested during a regulated hunting season. Black ducks can be harvested during split seasons that occur from October through December, depending on the zone (Lake Champlain, Interior, and Connecticut River zones). The estimated number of black ducks harvested from 2009 to 2013 during the annual hunting season is shown in Figure 4.1 (Sausville, personal communication, 2015).

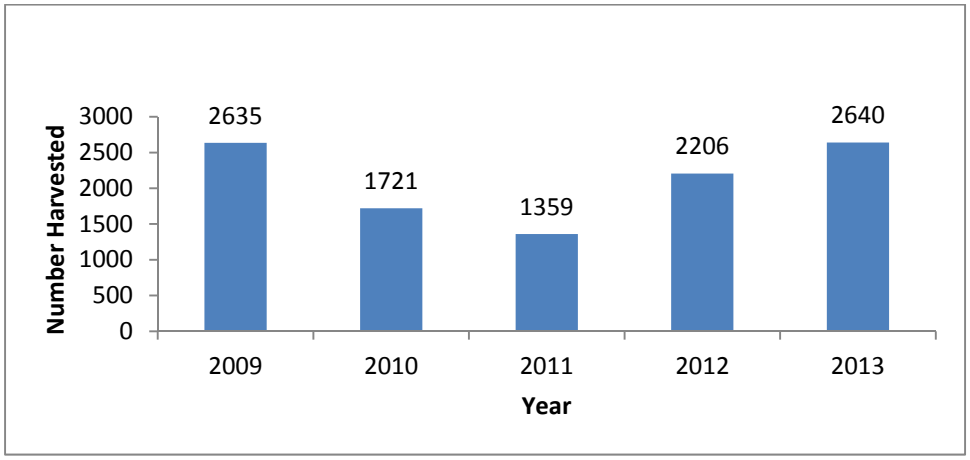

Figure 4.1 – Annual black duck harvest in Vermont, 2009-2013

WS' proposed annual removal of 100 would only account for a range of 3.8% and 7.4% of the annual harvest. Since 2010, the highest authorized removal for non-WS entities was five birds. These authorized removals are associated with protecting aviation safety at Vermont state airports.

Direct, Indirect, and Cumulative Effects:
Based on the best scientific data, WS' proposed removal level is expected to have no adverse direct or indirect effects on black duck populations within the state. The removal of black ducks by WS to alleviate damage will only occur when permitted by the USFWS pursuant to the MBTA through issuance of depredation permits. The potential authorized removal from all non-WS entities (including the annual

harvest) and WS proposed removal is not expected to create adverse cumulative impacts. The removal of black ducks by WS would only occur at levels authorized by USFWS and VFWD to ensure that WS' removal and the removal by all other entities, including annual hunter harvest, would be considered to maintain the desired population management levels of black ducks within Vermont. Additionally, WS proposed removal is of low magnitude when compared to the annual harvest numbers and therefore is not expected to hinder the ability of those interested persons in harvesting black ducks during the hunting season.

American Crow Biology and Population Impacts

VT population estimate: 79,000
BBS Atlantic Northern Forest, 1966-2013: 1.02%
BBS Atlantic Northern Forest, 2003-2013: 0.78%
BBS LGLSP, 1966-2013: 1.04%
BBS LGLSP, 2003-2013: 0.75%

WS proposed removal: 1,000 and 100 nests (and eggs)
BBS VT, 1966-2013: 0.38%
BBS VT, 2003-2013: 0.05%
WS removal as % of state population: 1.26%

American crows are highly adaptable and will live in any open place that offers a few trees to perch in and a reliable source of food. Crows regularly use both natural and human-created habitats, including farmlands, pastures, landfills, city parks, golf courses, cemeteries, yards, vacant lots, highway turnarounds, feedlots, and the shores of rivers, streams, and marshes. Large flocks of crows tend to concentrate in some areas where abundant food and roosting sites are available. In the fall and winter, crows often form large roosting flocks in urban areas. These large flocks disperse to different feeding areas during the day. Crows will fly up to 6-12 miles from the roost to a feeding site each day (Johnson 1994).

The number of crows addressed in Vermont by WS to alleviate damage is shown in Table 4.2. American crows can be harvested during a split season in Vermont. There is no estimate of the number of crows harvested annually during the hunting season. The removal by all non-WS entities is unknown due to the Federal Depredation Order (50 CFR 21.43) for blackbirds that was established by the USFWS (Sobeck 2010). Under the depredation order, no federal permit is required to remove crows if they are committing 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. No state permit is required as VFWD adopted the Federal Depredation Order which states: a person may kill common crows when found committing or about to commit serious depredations upon any ornamental or shade tree, agricultural crops, livestock, or wildlife, or when concentrated in such numbers and manner as to constitute a health hazard or other nuisance

Table 4.2 – Number of American crows addressed by WS from FY 2010 through FY 2014

Year	Dispersed by WS[1]	WS' Take[1]
2010	7,679	0
2011	6,500	5
2012	5,389	4
2013	10,432	64
2014	30,597	52
Average	12,119	25

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

Direct, Indirect, and Cumulative Effects:

WS proposed annual removal is not expected to create adverse direct or indirect effects on the American crow population in Vermont. Although non-WS removal is unknown, crows have maintained a historically increasing population that has remained viable enough to support an annual hunting season and a Federal Blackbird Depredation Order. Therefore, WS does not expect there to be significant adverse cumulative impacts to crow populations. Additionally, the USFWS could impose restrictions on depredation harvest as needed to assure cumulative removal does not adversely affect the continued viability of crow populations, which should also assure that cumulative impacts on crow populations would have no significant impact on the quality of the human environment. WS also does not expect crow populations to be impacted enough to limit the ability of those persons interested in harvesting crows during the regulated hunting season

Canada Goose Biology and Population Impacts

Atlantic/Resident population estimate: 808,963[1]	WS proposed removal: 2,000 + 1,000 nests (and eggs)
BBS Atlantic Northern Forest, 1966-2012: 15.27%	BBS VT, 1966-2012: 20.06%
BBS Atlantic Northern Forest, 2003-2012: 15.54%	BBS VT, 2003-2012: 20.97%
BBS LGLSP, 1966-2012: 15.06%	WS removal as % of population: 0.2%
BBS LGLSP, 2003-2012: 8.14%	Cumulative removal as % of population: 1.7%

[1]*Total Atlantic migratory and Vermont resident Canada goose population (Sausville, personal communication, 2015)*

Canada geese are a common site in Vermont, especially around ponds, lakes, marshes and golf courses. Canada geese lay an average of five eggs in a clutch and live approximately 20-25 years in the wild. There are two behaviorally-distinct types of Canada goose populations: resident and migratory. Although they may appear similar, they exhibit many different behaviors that affect the management of these birds. Typically resident geese are those that nest south of the Canadian border. Migratory geese fly south from Canada to VT beginning in late September and migrate primarily through the Champlain Valley area. In March, migrants go north of the Canadian border to begin nesting.

In the winter, resident geese may move south during cold weather. In Vermont the resident Canada goose population moves primarily to southern New England. During the spring throughout Vermont the resident population is estimated at 19,000 individuals. The resident number of Canada geese had increased steadily from 2008-2010 (Atlantic Flyway Council 2011). Vermont experiences a migrant population of Canada geese that pass through or near the state each spring and fall. In 2014 the Atlantic population, which generally migrates along the eastern edge of the United States, was estimated at 183,600 breeding pairs (Sausville, personal communication, 2015). The total estimated spring migratory Atlantic population was estimated at 785,600 individuals in 2014 (Sausville, personal communication, 2015). These numbers are likely higher during fall migration due to the inclusion of young of the year birds.

The resident population is monitored through the Atlantic Flyway Breeding Waterfowl Plot Survey. Population estimates derived during this survey indicate that within Vermont, resident goose population increased dramatically from an estimated 2,806 geese from the outset of the survey in 1994, to an estimated 23,363 resident geese in 2014.

Resident Canada goose population estimates are based on USFWS harvest estimates, survival rates from banding/neck collar studies, estimates from VFWD biologists and the midwinter inventory (Atlantic Flyway Council 2011). The Vermont resident Canada goose population objective is 20,000 birds (Atlantic Flyway Council 2011) and the current resident goose population has increased from 17,339 birds in 2009 to 23,363 birds in 2014 (Sausville, personal communication, 2015). Vermont Atlantic Flyway Breeding Waterfowl Survey data from 1966 through 2014 shows an increasing population trend for Canada geese as well.

Canada geese are migratory game birds that are afforded federal and state protection. Goose populations are managed by the USFWS and the VFWD pursuant to the MBTA, Federal Regulations (50 CFR 10, 13, 20 & 21), and other federal and state laws, regulations, policies, and court rulings. Procedures, such as handling nests and eggs, capturing and relocating birds, capturing and euthanizing birds, shooting birds to reduce damage, and any other activity that includes handling birds, their parts, and/or their nests and eggs requires compliance with these laws. A depredation permit is generally required to conduct any of these activities. Table 4.3 addresses the number of Canada geese removed under depredation permits in Vermont from FY 2010-2014.

Table 4.3 – Number of Canada geese addressed in Vermont from FY 2010 through FY 2014

Year	Dispersed by WS[1]	Removal under Depredation Permits			
		WS Authorized Removal[1]	WS' Removal[1]	Authorized Removal for Other Entities[2]	Removal by Other Entities[2]
2010	251	800	0	188	65
2011	114	800	0	190	57
2012	400	800	26	204	64
2013	900	800	30	166	48
2014	1250	800	44	157	N/A[3]
Average	**583**	**800**	**20**	**181**	**59**

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

Like many waterfowl species, Canada geese can be harvested during a regulated hunting season that traditionally occurs in the beginning of October through December, depending on zone. They can also be harvested during a special "Resident Canada goose Hunting Season" that occurs during the month of September (Figure 4.4). Since migrant geese do not arrive in Vermont until late September/early October, this hunt targets the overabundant resident goose population in Vermont.

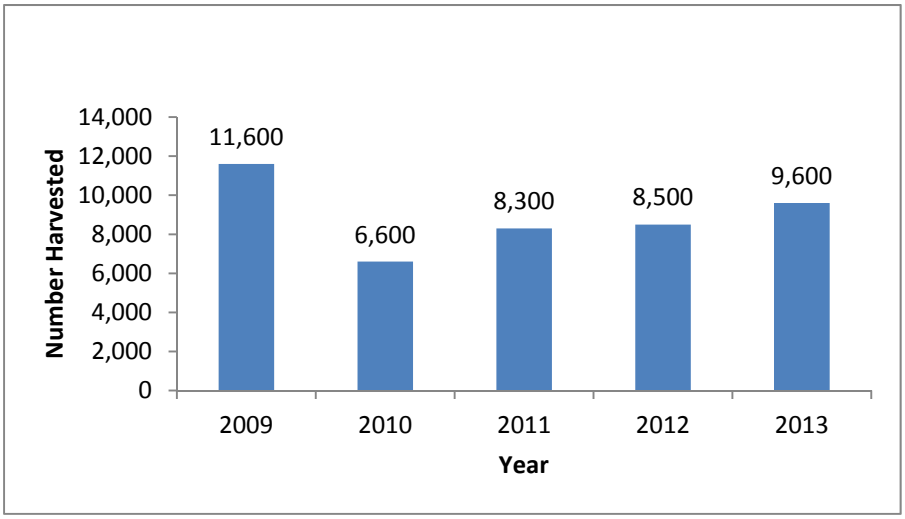

Figure 4.4 – Annual Canada goose harvest in Vermont, 2009-2013

Direct, Indirect, and Cumulative Effects:

WS' proposed annual removal of 2,000 birds will have no adverse direct or indirect effects on the resident Canada geese populations. WS does not typically remove geese during the migratory period; however, occasionally minimal numbers of geese are removed during this period at airports for the protection of human safety.

Canada goose nests are authorized to be destroyed (which may involve treatment of eggs by oiling, puncturing, or addling to inhibit reproduction) by the USFWS through depredation permits issued to WS. Nest destruction methods (i.e., treatment of eggs in the nest) are considered non-lethal when conducted before the development of an embryo. As with the lethal removal of geese, the destruction of nests must be authorized by the USFWS. Therefore, the number of geese lethally removed and the number of nests destroyed by WS annually would occur at levels permitted by the USFWS pursuant to the MBTA.

Additionally, the potential authorized removal from all non-WS entities combined with WS proposed removal and the annual harvest is not expected to create significant cumulative impacts to Canada goose populations. The removal of Canada geese by WS would only occur at levels authorized by the USFWS, which ensures WS' removal and removal by all entities, including hunter harvest, would be considered to achieve the desired population management levels of Canada geese in Vermont. Provided that the goose population allows for an annual harvest, WS' removal could be considered of low magnitude when compared to the number of geese observed in Vermont annually and therefore will not hinder the ability of those interested persons to harvest geese during the hunting season.

European Starling Biology and Population Impacts

VT population estimate: 160,000
BBS Atlantic Northern Forest, 1966-2013: -2.72%
BBS Atlantic Northern Forest, 2003-2013: -2.50%
BBS LGLSP, 1966-2013: -1.60%
BBS LGLSP, 2003-2013: -1.59%

WS proposed removal: 40,000 and 1,000 nests (and eggs)
BBS VT, 1966-2013: -1.91%
BBS VT, 2003-2013: -1.94%
WS removal as % of state population: 25%

The European starling is an Old World passerine species introduced in the eastern U.S. in the late 1800's. Starlings are considered an agricultural pest throughout North America. Additionally, they form large winter roosts in urban and suburban areas causing conflicts with society. The starling is found in virtually all Vermont habitats. Starlings nest in cavities and will readily evict most native cavity-nesting species. In the absence of natural cavities, they will nest in almost any enclosed area such as a street light, a mail box, or an attic (Brauning 1992).

European starlings are considered a non-native species in Vermont and are afforded no protection under the MBTA. Therefore, no depredation permit is required from the USFWS to take of starlings, although a state permit from VFWD can be required. The number of starlings lethally removed to alleviate damage or threats in Vermont is unknown since the reporting of starling take is not required. The number of starlings dispersed and lethally removed by WS from FY 2010 through FY 2014 can be seen in Table 4.5. Executive Order 13112 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 associated damages, 2) monitor invasive species populations, 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 on invasive species.

Table 4.5 – Number of European starling addressed by WS from FY 2010 through FY 2014

Year	Dispersed by WS[1]	WS' Take[1]
2010	0	6,137
2011	0	18,973
2012	0	19,743
2013	1,200	11,859
2014	1,933	3,180
Average	**626**	**11,978**

[1]Data reported by federal fiscal year

Direct, Indirect, and Cumulative Effects:
Based on the best scientific data, WS' proposed annual removal level will have no adverse direct or indirect effects on European starling populations. While non-WS removal is unknown, starling populations have remained relatively stable and have historically expanded their range throughout North America. Additionally, starling populations have remained abundant enough that the USFWS has maintained the Federal Blackbird Depredation Order. Therefore, WS does not anticipate any significant cumulative impacts to starling populations

Feral Waterfowl Biology and Population Impacts

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

Many waterfowl of domestic or semi-wild genetic backgrounds have been released by humans into rural and urban environments, including numerous species of ducks, geese, and swans. Selective breeding has resulted in the development of numerous domestic varieties of the mallard duck that no longer exhibit the external characteristics or coloration of their wild mallard ancestors.

Domestic waterfowl have been purchased and released by property owners for their aesthetic value, but those released waterfowl may not always remain at the release sites; thereby, becoming feral. Feral waterfowl are defined as a domestic species of waterfowl that cannot be linked to a specific ownership. Examples of areas where domestic waterfowl have been released are business parks, universities, wildlife management areas, parks, military bases, residential communities, and housing developments. Many times, those birds are released with no regard or understanding of the consequences or problems they can cause to the environment or the local community.

Federal law does not protect domestic varieties of waterfowl (see 50 CFR 21), nor are domestic waterfowl specifically protected by state law in Vermont. Domestic waterfowl may at times cross breed with migratory waterfowl species, creating a hybrid cross breed (e.g., mallard X domestic duck, Canada goose X domestic goose). Those types of hybrid waterfowl species would be removed in accordance with definitions and regulations provided in 50 CFR 10 and 50 CFR 21.

Domestic ducks, geese, and swans are non-indigenous species considered by many wildlife biologists and ornithologists to be an undesirable component of native ecosystems in North America. Any reduction in

the number of these domestic waterfowl species could be considered as benefiting other native bird species since they compete with native wildlife for resources. Domestic and feral waterfowl are almost always found near water, such as ponds, lakes, retaining pools, and waterways. Domestic and feral waterfowl generally reside in the same area year-round with little to no migration occurring. Currently, population estimates do not exist for domestic and feral waterfowl in Vermont.

Vermont has no identified population of Muscovy ducks in the state. The USFWS has recently changed the regulations governing Muscovy ducks. Because Muscovy ducks occur naturally in southern Texas, this species has been added to the list of migratory birds afforded protection under the MBTA. However, it has been introduced and is not native in other parts of the United States, including Vermont. The USFWS now prohibits sale, transfer, or propagation of Muscovy ducks for hunting and any other purpose other than food production, and allows their removal in locations in which the species does not occur naturally in United States, including Vermont. The USFWS has revised 50 CFR 21.14 (permit exceptions for captive-bred migratory waterfowl other than mallard ducks) and 50 CFR 21.25 (waterfowl sale and disposal permits), and has added 50 CFR 21.54, which is an order to allow control of Muscovy ducks, their nests, and eggs.

The number of feral waterfowl lethally removed by non-WS entities to alleviate damage or threats in Vermont is unknown since the reporting of feral waterfowl removal is not required. Although no specific hunting season has been designated specifically for feral waterfowl, some domestic or feral waterfowl are harvested during the annual hunting season for free-ranging waterfowl.

Direct, Indirect, and Cumulative Effects:

Based on previous requests for assistance and in anticipation of additional efforts, WS could lethally remove up to 200 feral ducks or feral geese and up to 100 feral waterfowl nests (and eggs) could be destroyed annually under the proposed action. Additionally, WS could lethally remove up to 200 Muscovy ducks and up to 100 Muscovy duck nests (and eggs) could be destroyed annually under the proposed action. Although the number of feral waterfowl inhabiting Vermont is currently unknown, based on the limited removal proposed and the likely benefit to the natural environment that could occur, WS proposed removal level will have no adverse direct or indirect effects on feral waterfowl populations, including Muscovy ducks. Additionally, WS proposed removal combined with potential removal by non-WS entities, including hunter harvest, is not expected to create adverse cumulative impacts on feral waterfowl populations.

House Sparrow Biology and Population Impacts

VT population estimate: 80,000
BBS Atlantic Northern Forest, 1966-2013: -6.22%
BBS Atlantic Northern Forest, 2003-2013: -5.56%
BBS LGLSP, 1966-2013: -2.59%
BBS LGLSP, 2003-2013: -2.62%

WS proposed removal: 1,500 + 1,000 nests (and eggs)
BBS VT, 1966-2013: -3.21%
BBS VT, 2003-2013: -3.14%
WS removal as % of state population: 1.87%

House sparrows were introduced to North America from England in 1850 and have spread throughout the continent (Fitzwater 1994). Nesting locations often occur in areas of human activities and are considered "*...fairly gregarious at all times of year*" with nesting occurring in small colonies or clumped distribution (Lowther and Cink 2006). Large flocks of sparrows can also be found in the winter as birds forage and roost together. CBC data from 1966 to 2013 for Vermont shows a negative trend for wintering populations of house sparrows (NAS 2015).

Like European starlings, because of their negative effects on and competition with native bird species, house sparrows are considered by many wildlife biologists, ornithologists, and naturalists to be an

undesirable component of North American ecosystems. Since house sparrows are an introduced, rather than native species, they are not protected by the MBTA, and take of house sparrows does not require depredation permits issued by either the USFWS or the VFWD. Executive Order 13112 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 associated damages, 2) monitor invasive species populations, 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 on invasive species. The number of sparrows lethally removed by non-WS entities to alleviate damage or threats in Vermont is unknown since the reporting of sparrow removal is not required.

Direct, Indirect, and Cumulative Effects:

WS' removal of house sparrows to reduce damage and threats would be in compliance with Executive Order 13112. WS' proposed annual removal is only a fraction of a percent of the statewide population and therefore will have no adverse direct or indirect effects on sparrow populations. Although non-WS removal is unknown, house sparrow populations have remained relatively stable and have historically expanded their range throughout North America. Therefore, WS does not anticipate any significant cumulative impacts to sparrow populations

Killdeer Biology and Population Impacts

WS proposed removal: 100 + 25 nests (and eggs)
BBS Atlantic Northern Forest, 1966-2013: -4.31%
BBS Atlantic Northern Forest, 2003-2013: -3.94%
BBS LGLSP, 1966-2013: -2.63%
BBS LGLSP, 2003-2013: -1.43%
BBS VT, 1966-2013: -2.15%
BBS VT, 2003-2013: -1.57%
WS removal as % of population: 0.005%
Cumulative removal as % of population: 0.005%

Killdeer are by far the most wide-spread and familiar of North American plovers because of its habitat, their tolerance of humans, their easily observed parental care, and their distinct vocalizations (Jackson et al. 2000). Killdeer are probably more common today than at any time in its history as a result of habitat changes brought on by humans (Jackson et al. 2000). Survey data from the CBC indicates the number of killdeer within the state has shown a generally decreasing trend since 1966 (NAS 2015). The population of killdeer in the United States is estimated to be approximately 2,000,000 birds (Andres et al. 2012).

The number of killdeer addressed in Vermont by all entities to alleviate damage is shown in Table 4.6. The highest authorized removal by non-WS entities (10 birds) in addition to the WS proposed removal was used to assess the cumulative removal.

Table 4.6 – Number of killdeer addressed by WS from FY 2010 through FY 2014

Year	Dispersed by WS[1]	Removal under Depredation Permits		
		WS' Removal[1]	Authorized Removal for Other Entities[2]	Removal by Other Entities[2]
2010	0	0	0	0
2011	0	0	0	0
2012	0	0	10	0
2013	7	2	10	0
2014	34	4	10	0
Averages	**8.2**	**1.2**	**6**	**0**

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

Direct, Indirect, and Cumulative Effects:
Requests for assistance associated with killdeer occur primarily at airports. WS would continue to assist airport personnel in identifying habitat and other attractants to killdeer on airport property. Killdeer requests for assistance would be addressed using primarily non-lethal harassment and dispersal methods. Based on the best scientific data, WS proposed annual removal level will have no adverse direct effects on killdeer populations. If habitat modification and non-lethal harassment methods occur within airport property to minimize the attraction of killdeer on the property, then there could be an indirect impact on the nesting and/or breeding success of individuals that originally nested on the airport property; this localized indirect impact would be minimal and therefore would not cause significant effects on the state killdeer populations. The potential authorized removal from all non-WS entities combined with WS proposed removal is also not expected to create adverse cumulative impacts. All removal of killdeer would occur within the levels permitted by the USFWS pursuant to the MBTA.

Mallard Biology and Population Impacts

Atlantic Flyway population estimate (VT): 26,206
BBS Atlantic Northern Forest, 1966-2013: 8.37%
BBS Atlantic Northern Forest, 2003-2013: 10.50%
BBS LGLSP, 1966-2013: 2.87%
BBS LGLSP, 2003-2012: 1.12%
WS removal as % of state population: 1.5%
Cumulative removal as % of state population[1]: 50.0%
[1]*Percentage does not account for influx of fall migrants*

WS proposed removal: 400 birds + 100 nests
BBS VT, 1966-2013: 7.18%
BBS VT, 2003-2013: 7.36%

Mallards are one of the most recognizable waterfowl species and are considered the most abundant waterfowl species with the widest breeding range (Drilling et al. 2002). Mallards can be found wintering as far north as weather conditions allow (Drilling et al. 2002). The fall migration period begins in early August and continues through early-December with the peak occurring from early September through the end of November. The spring migration begins in early February and continues through early May with the peak occurring from mid-February through the end of May (Drilling et al. 2002).

The number of mallards observed in the state during the Atlantic Flyway Breeding Waterfowl Survey conducted in 2014 was estimated at 26,206 (Sausville, personal communication, 2015). In 2013, the number of mallards observed during the Atlantic Flyway Breeding Waterfowl Survey in Vermont was 25,307 (Sausville, per comm, 2015). The estimated population for mallards was 10.9 ± 0.3 million in 2014, which is 42% above the long-term average (USFWS 2014). The mallard population throughout the Atlantic flyway in 2014 was estimated at 634,582 birds and 301,698 pairs (Atlantic Flyway Breeding Waterfowl Survey).

Like other waterfowl species, mallards can be harvested during a regulated hunting season. In Vermont, mallards can be harvested during split seasons that occur from October through December, depending on the zone (Lake Champlain, Interior, and Connecticut River zones). The estimated number of mallards harvested from 2009 to 2013 during the annual hunting season is shown in Figure 4.7 (Sausville, per comm, 2015).

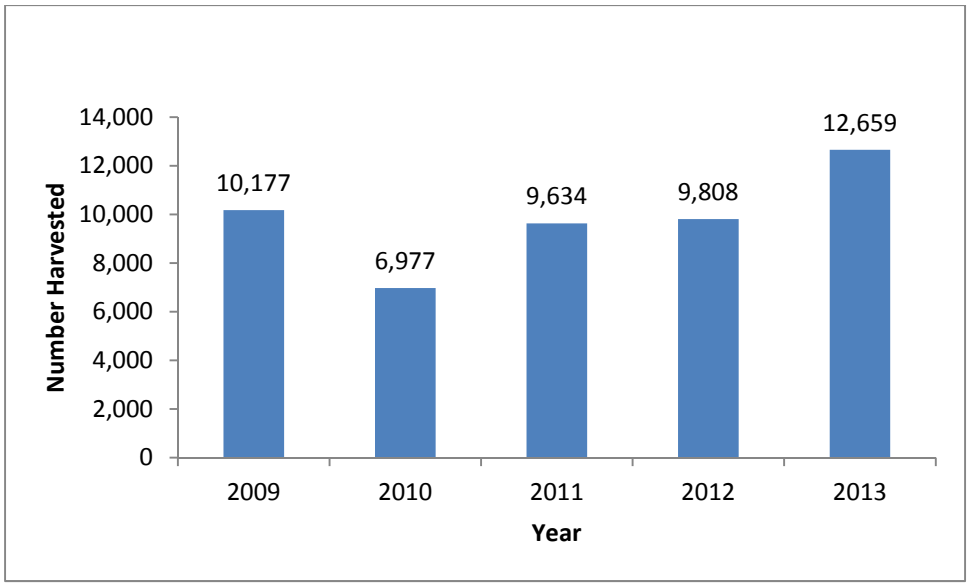

Figure 4.7 – Annual mallard harvest in Vermont, 2009-2013

The number of mallards addressed in Vermont by WS and other entities to alleviate damage is shown in Table 4.8. The annual harvest of mallards in Vermont ranged from 6,977 to 12,659 since 2009; WS' proposed annual removal of 400 would only account for a range of 3.2% to 5.7% of the annual harvest.

Table 4.8 – Number of mallards addressed by WS from FY 2010 through FY 2014

Year	Dispersed by WS[1]	Removal under Depredation Permits			
		WS Authorized Removal[1]	WS' Removal[1]	Authorized Removal for Other Entities[2]	Removal by Other Entities[2]
2010	0	10	0	15	0
2011	0	10	0	15	0
2012	35	10	0	15	0
2013	28	20	1	15	0
2014	45	20	5	10	N/A[3]
Average	**22**	**14**	**1**	**14**	**0**

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

Direct, Indirect, and Cumulative Effects:

Based on the best scientific data, WS' proposed removal level is expected to have no adverse direct or indirect effects on mallard populations within the state. The removal of mallards by WS to alleviate damage will only occur when permitted by the USFWS pursuant to the MBTA through issuance of depredation permits. The potential authorized removal from all non-WS entities (including the annual harvest) and WS proposed removal is not expected to create adverse cumulative impacts. The removal of mallards by WS would only occur at levels authorized by USFWS and VFWD to ensure that WS' removal and the removal by all other entities, including annual hunter harvest, would be considered to maintain the desired population management levels of mallards within Vermont. Additionally, WS proposed removal is of low magnitude when compared to the annual harvest numbers and therefore is not expected to hinder the ability of those interested persons in harvesting mallards during the hunting season.

Rock Pigeon Biology and Population Impacts

VT population estimate: 40,000
BBS Atlantic Northern Forest, 1966-2013: 2.41%
BBS Atlantic Northern Forest, 2003-2013: 2.37%
BBS LGLSP, 1966-2013: -0.99%
BBS LGLSP, 2003-2013: -1.05%

WS proposed removal: 4,000 + 2,000 nests (and eggs)
BBS VT, 1966-2013: 0.24%
BBS VT, 2003-2013: -0.70%
WS removal as % of state population: 10%

Pigeons are an introduced species, and therefore they are not protected by federal law or state law. Pigeons are closely associated with humans as human structures and activities provide them with food and sites for roosting, loafing, and nesting (Williams and Corrigan 1994). Thus, they are commonly found around city buildings, bridges, parks, farm yards, grain elevators, feed mills, and other man-made structures (Williams and Corrigan 1994). Additionally, although pigeons are primarily grain and seed eaters, they will readily feed on garbage, livestock manure, spilled grains, insects, and any other available bits of food (Williams and Corrigan 1994).

The take of pigeons to alleviate damage or to reduce threats can occur without the need for a depredation permit from the USFWS. The number of pigeons lethally removed to alleviate damage or threats in Vermont is unknown since the reporting of pigeon removal is not required. The number of rock pigeons dispersed and lethally removed by WS from FY 2010 through FY 2014 can be seen in Table 4.9.

Table 4.9 – Number of rock pigeons addressed by WS in Vermont from FY 2010 through FY 2014

Year	Dispersed by WS[1]	WS' Take[1]
2010	0	69
2011	0	225
2012	0	305
2013	0	503
2014	0	617
Average	**0**	**343**

[1]Data reported by federal fiscal year

Direct, Indirect, and Cumulative Effects:

WS' proposed pigeon damage management activities would be conducted pursuant to Executive Order 13112. The Executive 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 associated damages, 2) monitor invasive species populations, 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 on invasive species. WS' proposed annual removal is of a low magnitude compared with the statewide population and therefore will have no adverse direct or indirect effects on rock pigeon populations. Although non-WS removal is unknown, WS does not anticipate any significant adverse cumulative impacts on pigeon populations.

Horned Lark Biology and Population Impacts

BCR 13 + 14 regional population estimate: 303,000[1]
BBS Atlantic Northern Forest, 1966-2013: -12.01%
BBS Atlantic Northern Forest, 2003-2013: -9.40%
BBS LGLSP, 1966-2013: -3.30%
BBS LGLSP, 1966-2013: -4.82%
[1]*Partners in Flight*

WS proposed removal: 200
BBS VT, 1966-2013: -22.11%
BBS VT, 2003-2013: -24.06%
WS removal as % of regional population: 0.06%
Cumulative removal as % of regional population: 0.07%

Preferred habitat for horned larks consists of open country including short grass prairie, deserts, and alpine habitat or other areas with low vegetation (Beason 1995), making airports attractive habitat. A social species, horned larks form flocks during the non-breeding season of up to several hundred birds which may join with other flocks of tree sparrows (*Spizella arborea*), dark-eyed juncos (*Junco hyemalis*), lapland longspurs (*Calcarius lapponicus*), and snow buntings (*Plectrophenax nivalis)* (Beason 1995).

The number of horned larks addressed in Vermont by WS and other entities to alleviate damage is shown in Table 4.10. Requests for assistance often arise from airports where the gregarious flocking behavior of horned larks can pose risks to aircraft at or near airports. Based on the possibility of increasing need to address damage and threats associated with horned larks in Vermont, up to 200 horned larks could be taken by WS annually to address damage or threats. The highest authorized removal for non-WS entities (25 birds) in addition to the WS proposed removal was used to assess the cumulative removal.

Table 4.10 – Number of horned larks addressed by WS from FY 2010 through FY 2014

Year	Dispersed by WS[1]	Removal under Depredation Permits			
		WS Authorized Removal[1]	WS' Removal[1]	Authorized Removal for Other Entities[2]	Removal by Other Entities[2]
2010	0	10	0	5	0
2011	0	10	0	5	0
2012	0	10	0	25	0
2013	100	10	0	25	0
2014	10	10	0	25	N/A[3]
Average	**22**	**10**	**0**	**17**	**0**

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

Direct, Indirect, and Cumulative Effects:
Based on the best scientific data, WS proposed removal level will have no adverse direct or indirect effects on horned lark populations. The potential authorized removal from all non-WS entities combined with WS proposed removal is also only a small percent of the regional BCR population and therefore it is not expected to create adverse cumulative impacts. The permitting of the removal by the USFWS pursuant to the MBTA ensures removal by WS and by other entities occurs within allowable removal levels to achieve the desired population objectives for horned larks in Vermont.

Snow Bunting Biology and Population Impacts

North American population estimate: 14,000,000[1] WS proposed removal: 200
WS removal as % of North American population: 0.001%
Cumulative removal as % of North American population: 0.002%
[1]*Partners in Flight*

During winter, snow buntings are observed across southern Canada and the northern United States (Montgomerie et al. 2011). Snow buntings winter in open weedy grassy fields, grain stubbles, shores; after heavy snowfall they are conspicuous on roadsides and in farmyards (Godfrey 1986). In Vermont, snow buntings are a common visitor to airfields, typically congregating in large flocks near taxiways and runways.

Snow buntings are arctic breeders; therefore no BBS data is available. From 1966 through 2013, overwintering populations of snow buntings across the United States as well as Vermont have remained stable (NAS 2010). The Partners in Flight Science Committee (2013) estimates the North American population of snow buntings is 14,000,000.

The number of snow buntings addressed in Vermont by WS and other entities to alleviate damage is shown in Table 4.11. The habitat preferences of snow buntings often link this species to airports, where most requests for assistance arise. The flocking behavior or snow buntings create a threat to aircraft and passenger safety in the airport environment. Based on the possibility of increasing need to address damage and threats associated with snow buntings in Vermont, up to 200 snow buntings could be taken by WS annually to address damage or threats. The highest authorized removal for non-WS entities (125 birds) in addition to the WS proposed removal was used to assess the cumulative removal.

Table 4.11 – Number of snow buntings addressed in Vermont from FY 2010 through FY 2014

Year	Dispersed by WS[1]	Removal under Depredation Permits			
		WS Authorized Removal[1]	WS' Removal[1]	Authorized Removal for Other Entities[2]	Removal by Other Entities[2]
2010	0	10	0	125	4
2011	0	10	0	125	20
2012	0	10	0	125	0
2013	415	10	4	125	0
2014	1,132	10	0	125	N/A[3]
Average	**309**	**10**	**0.8**	**125**	**6**

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

Direct, Indirect, and Cumulative Effects:
Based on the best scientific data, WS proposed removal level will have no adverse direct or indirect effects on snow bunting populations. The majority of the direct operational assistance conducted by WS on snow buntings would occur in the winter and therefore would have no indirect effects on snow buntings. The potential limited take of snow buntings, in comparison to the overall population, should not adversely affect snow bunting populations in Vermont. Like other bird species, the take of snow buntings by WS to alleviate damage will only occur when permitted by the USFWS and the pursuant to the MBTA through the issuance of a depredation permit. Therefore, the take of snow buntings by WS will only occur at levels authorized by the USFWS which ensures WS' take and take by all entities are considered to achieve the desired population management levels of snow buntings in the Vermont.

Snow Goose Biology and Population Impacts

Greater snow goose population estimate: 921,000 WS proposed removal: 200 birds
WS removal as % of Atlantic population: 0.02%
Cumulative removal as % of Atlantic population: 0.49%
[1]*Spring estimate, USFWS Waterfowl Population Status, 2013*

Snow geese breed across the extreme northern portions of Canada and along the Arctic coast (Mowbray et al. 2000). No breeding populations of snow geese occur in Vermont. However, snow geese are migrants through Vermont with large numbers of snow geese migrating through the state both in the spring and fall (Mowbray et al. 2000). The fall migration period occurs from September through November with the spring migration occurring from late February through the first part of June (Mowbray et al. 2000). In the Atlantic Flyway snow goose numbers have increased from approximately 50,000 birds in the mid 1960's to more than one million birds today (NY DEC, 2015). These numbers are composed primarily of greater snow geese. Managers concerned with the overabundance of snow geese and the damage they create have recommended reducing the Atlantic Flyway number to a population goal of 500,000-750,000 (NY DEC, 2015). Large numbers of feeding snow geese have been documented to destroy natural vegetation and coastal marshlands as well as agricultural crops.

Like many other waterfowl species, snow geese can be harvested during regulated hunting seasons in Vermont. Snow geese can be harvested during both the fall hunting season and spring conservation order. In fall, snow geese can be harvested from October through December in three different management zones in Vermont. In spring, snow geese can be harvested from March through April. The fall hunting season allows for a 25 bird bag limit per day, while the spring allows for a 15 bird bag limit per day. Harvest numbers for snow geese in Vermont has ranged from a high of 4,400 snow geese in 2000 to a low of zero in 2012 and 2013. The 14-year average harvest was estimated at 1,300 annually. Snow goose populations have increased dramatically since the mid-1970s and have reached historic highs across their breeding and wintering range. The population is estimated to be at 6.7 million; however this estimate is soon likely to be superseded due to the increasing population (Mowbray et al. 2000).

Based upon past requests for WS' assistance and in anticipation of additional efforts to reduce threats associated with snow geese, WS anticipates that no more than 200 snow geese would be lethally removed by WS annually under the proposed action. The number of snow geese addressed in Vermont by WS and during the legal hunting seasons is not expected to adversely affect the regional population.

Direct, Indirect, and Cumulative Effects:
All removal of snow geese by WS would occur only after a depredation permit had been issued by the USFWS either to WS or to the entities experiencing damage or threats of damage. If a permit was issued to an entity other than WS, WS participation in damage management activities requiring lethal removal would occur as an agent of the cooperating entity under the depredation permit. Due to the rapidly increasing population, WS proposed annual removal is expected to have no adverse direct or indirect effects on snow geese populations. Additionally, WS proposed removal combined with the potential removal by non-WS entities, including annual harvest, is not expected to create adverse cumulative impacts on snow geese populations. WS' limited proposed removal would not hinder the ability of those interested persons to harvest snow geese during the hunting seasons.

Turkey Vulture Biology and Population Impacts

BCR 13+14 regional population estimate: 88,000
BBS Atlantic Northern Forest, 1966-2013: 9.85%
BBS Atlantic Northern Forest, 2003-2013: 9.7%
BBS LGLSP, 1966-2013: 7.45%
BBS LGLSP, 2003-2013: 7.23%
WS proposed removal: 750
BBS VT, 1966-2013: 10.74%
BBS VT, 2003-2013: 10.75%
WS removal as % of regional population: 0.85%
Cumulative removal as % of regional population: 0.88%

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

The number of turkey vultures addressed in Vermont by all entities to alleviate damage is shown in Table 4.13. The highest combined authorized removal by non-WS entities (31 birds) in addition to the WS proposed removal was used to assess the cumulative removal.

Table 4.13. Number of turkey vultures addressed in Vermont from FY 2010 to FY 2014

Year	Dispersed by WS[1]	Take under Depredation Permits			
		WS Authorized Removal[1]	WS Removal[1]	Authorized Removal for Other Entities[2]	Removal by Other Entities[2]
2010	95	10	0	25	0
2011	2	10	0	25	0
2012	49	15	8	25	0
2013	38	15	2	31	0
2014	153	15	0	25	0
Average	**67.4**	**13**	**2**	**26.2**	**0**

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

Direct, Indirect, and Cumulative Effects:
Based on the best scientific data, WS proposed annual removal level will have no adverse direct effects on regional vulture populations. The majority of the direct operational assistance conducted by WS on turkey vultures are the result of threats to aviation safety by towering birds at a landfill facility near an airport and on the grounds of an International airport. However, if assistance occurs elsewhere, there could be an impact on the nesting and/or breeding success of individuals that are in close proximity to that area; this localized impact would be minimal and therefore would also not cause adverse indirect effects on the regional turkey vulture populations. Additionally, the potential authorized removal from all non-WS entities combined with WS proposed removal is not expected to create adverse cumulative impacts. The permitting of the removal by the USFWS pursuant to the MBTA ensures removal by WS and by other entities occurs within allowable removal levels to achieve the desired population objectives for turkey vultures in BCR 13 and 14.

Wild Turkey Biology and Population Impacts

VT population estimate: 50,000
BBS Atlantic Northern Forest, 1966-2013: 16.31%
BBS Atlantic Northern Forest, 2003-2013: 19.91%
BBS LGLSP, 1966-2013: 16.03%
BBS LGLSP, 2003-2013: 17.67%
WS proposed removal: 500
BBS VT, 1966-2013: 14.03%
BBS VT, 2003-2013: 15.61%
WS removal as % of state population: 1%
Cumulative removal as % state population: 14.9%

Wild turkeys found in Vermont consist of the Eastern wild turkey subspecies that is endemic to the eastern half of the United States (Kennamer 2010). The Eastern wild turkey can be found in 38 states and four Canadian provinces, ranging from southern Canada and New England to northern Florida and west to Texas, Missouri, Iowa, and Minnesota (Kennamer 2010). Wild turkeys inhabit hardwood, mixed, and pine forests foraging on a variety of acorns, fruit, seeds, and insects. Turkeys are considered permanent residents in states where they are present and are considered non-migratory. There are an estimated 5.1 million to 5.3 million wild turkeys in the Eastern subspecies in the United States and Canada (National Wild Turkey Federation 2014).

Populations of turkeys in Vermont are sufficient to allow for annual hunting seasons. The statewide population is estimated at more than 50,000 birds with an annual hunting harvest of approximately 5,800 turkeys (VFWD 2015). The numbers of turkeys harvested from 2010 through 2014 during the annual turkey hunting seasons are shown in Figure 4.14.

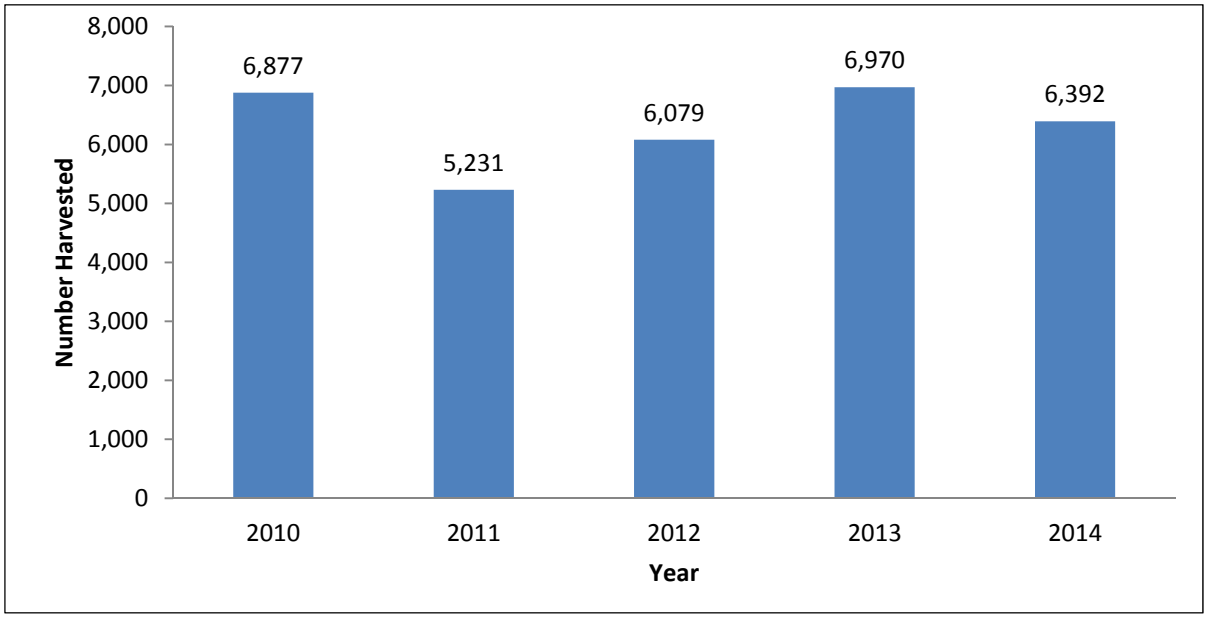

Figure 4.14–Figure 4.14 Turkey harvest in Vermont 2010 – 2014 (VFWD 2015).

The number of wild turkeys addressed in Vermont by WS and other entities to alleviate damage is shown in Table 4.15. The VFWD issues permits to remove turkeys at airports to alleviate threats to aircraft and human health and safety. WS removal activities are seldom conducted under permits issued to airports. WS proposed removal of 500 would only account for a range of 9.5% and 7.1% of the annual harvest. The highest authorized removal for non-WS entities (25 birds) in addition to the WS proposed removal and the highest number of wild turkeys harvested since 2010 was used to assess the cumulative removal.

Table 4.15. Number of wild turkeys addressed in Vermont from FY 2010 to FY 2014

Year	Dispersed by WS[1]	Removal under Depredation Permits			
		WS Authorized Removal[1]	WS' Removal[1]	Authorized Removal for Other Entities[2]	Removal by Other Entities[2]
2010	4	15	0	25	0
2011	23	15	0	25	0
2012	4	15	0	25	0
2013	12	15	1	25	0
2014	30	15	0	25	1
Average	**14.6**	**15**	**.2**	**25**	**0.2**

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

Direct, Indirect, and Cumulative Effects:
Based on the best scientific data, WS' proposed annual removal level will have no adverse direct or indirect effects on wild turkey populations. With a minimum statewide population estimated at 50,000 turkeys (VFWD 2015), the take of up to 500 turkeys by WS would represent 1.1% of the estimated statewide population if the population remains at least stable. WS proposed take combined with the highest recent hunter harvest (6,970) would represent 14.9% of the statewide population. Provided that the turkey population allows for an annual hunting harvest and WS' take is a fraction of a percent of the annual harvest, the cumulative take will not adversely affect the state turkey populations.

Snowy Owl Biology and Population Impacts

North American population estimate: 100,000 WS proposed removal: 10
WS removal as % of North American population: 0.01%

Snowy owls can be observed during the non-breeding season across southern Canada and the northern portion of the United States (Parmelee 1992). In winter 2014, Vermont airfields observed a large influx of snowy owls that caused numerous safety hazards to aircraft. Snowy owls are a large-bodied bird that can cause substantial damage. Preferred habitat includes open areas with rises or structures to perch on (Parmelee 1992). Snowy owls are attracted to the open habitat of airfields and may occur at any airfield in Vermont. Unlike most owls, snowy owls are largely diurnal relying on sight and to a certain extent sound to locate small mammals, rabbits and birds (Parmelee 1992).

Because they are arctic breeders no BBS data on snowy owls is available. However snowy owls nesting in northern portions of Canada and along the arctic coast overwinter in Vermont (Parmelee 1992). The number of snowy owls observed overwintering in Vermont during the CBC has shown a stable trend (NAS 2010).

Requests for assistance often arise from airports when snowy owl behavior can pose risks to aircraft at or near airports. When snowy owls persist in these areas, WS could trap and translocate them. WS captured and relocated two snowy owls in 2014. However, trapping may not always be a feasible option. In order for trapping to occur on or adjacent to active runways and taxiways, WS personnel would be subjected to human health and safety risks. If active runways and taxiways were temporarily shut down to allow access by personnel while trapping, this would alter flight patterns, delay schedules, and cause major aberrations to air traffic.

Direct, Indirect, and Cumulative Effects:
Based on the best scientific data, WS proposed annual removal level will have no adverse direct effects on snowy owl populations. The majority of the direct operational assistance conducted by WS on snowy owls would occur in the winter and therefore would have no indirect effects on snowy owls. WS could also live-capture and translocate up to 40 snowy owls annually under the proposed action alternative. Owls live-captured and relocated could also be banded for identification purposes. The take or translocation of snowy owls can only occur when permitted by the USFWS. Therefore, all take is authorized by the USFWS and occurs at the discretion of the USFWS. The take of snowy owls would only occur at levels authorized by the USFWS which ensures cumulative take is considered as part of population management objectives for these birds.

Mute Swan Biology and Population Impacts

WS proposed removal: 100 + all nests (and eggs)
BBS LGLSP, 1966-2012: 32.06%
BBS LGLSP, 2002-2012: 22.56%

Mute swans are considered a non-native species under the MBTA, as amended by the Migratory Bird Treaty Reform Act of 2004. Therefore, mute swans are afforded no protection under the Act. Mute swans are considered by many wildlife biologists and ornithologists to be an undesirable component of North American native ecosystems due to their detrimental effects. Given the invasive status of mute swans, any reduction in mute swan populations or elimination of entire populations, could be considered a beneficial effect to the environment since native habitats and the fish, wildlife, and invertebrates that rely on them are being negatively impacted by the presence of mute swans.

In 2003, the Atlantic Flyway Council adopted a Mute Swan Management Plan with the goals of reducing mute swan populations in the flyway to levels that would minimize negative impacts on wetland habitats and native waterfowl, and prevent range expansion into unoccupied areas. To minimize negative impacts on wetlands and native waterfowl, the Plan called for a reduction of the mute swan population in the Atlantic Flyway to less than 3,000 swans by 2013 (Atlantic Flyway Council 2003). From 2008 to 2013, the Atlantic Flyway Breeding Waterfowl Plot Survey estimated the population of mute swans has increased from 21,251 swans to 24,468 (Klimstra and Padding 2012).

The management objective for mute swans in Vermont is to maintain a zero population of swans (D. Sausville pers. Comm.). As with domestic and feral waterfowl, any reduction of the mute swan population in Vermont, even to the extent of complete eradication from the natural environment, could be considered as providing some benefit to native waterfowl species and ecosystems. Since mute swans are an introduced, rather than native species, they are not protected by the MBTA, and removal of mute swans does not require depredation permits issued by either the USFWS or the VFWD. Executive Order 13112 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 associated damages, 2) monitor invasive species populations, 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 on invasive species. The number of mute swans lethally removed by non-WS entities to alleviate damage or threats in Vermont is unknown.

Direct, Indirect, and Cumulative Effects:
WS removal of up to 100 mute swans annually would occur within the current management objectives established in the Atlantic Flyway and any future management objectives, including those established by the VFWD. The number of mute swans taken annually by other entities within Vermont is currently

unknown. However, cumulative take would occur within the management objectives for the Atlantic Flyway, including population objectives established for Vermont.

Bald Eagle Biology and Population Impacts

WS proposed removal: 2 nests
BBS Atlantic Northern Forest, 1966-2013: 6.13%
BBS Atlantic Northern Forest, 2003-2013: 9.69%
BBS LGLSP, 1966-2013: 6.91%
BBS LGLSP, 2003-2013: 10.83%

The bald eagle is a large raptor often associated with aquatic habitats across North America with breeding populations occurring primarily in Alaska and Canada; however, eagles have been documented nesting in all 48 contiguous states, except Rhode Island and Vermont (Buehler 2000). Ten to twelve pairs of bald eagles nested in Vermont in 2014 (d. Sausville per. Comm. 2015). Nesting normally occurs from late-March through September with eggs present in nests from late-March through the end of May. Eaglets can be found in nests generally from late-May through mid-September (Buehler 2000).

Although officially removed from the protection of the ESA across most of its range, the bald eagle is still afforded protection under the Bald and Golden Eagle Protection Act. In addition, the VFWD lists the bald eagle as "*endangered"* in the state.

The USFWS developed an EA that evaluated alternatives and issues associated with regulations establishing new permits for the take of eagles pursuant to the Act (USFWS 2012). Based on the evaluations in the EA and a FONSI, the selected alternative in the EA established new permit regulations for the "*take*" of eagles (see 50 CFR 22.26) and a provision to authorize the removal of eagle nests (see 50 CFR 22.27).

WS has received requests for assistance associated with bald eagles posing threats to safety at or near airports in Vermont. The large body size and soaring behavior of eagles can pose threats of aircraft strikes when eagles occur in close proximity to airports. Given the definition of "*disturb*" under the Act as described above, the use of harassment methods to disperse eagles posing threats at or near airports could constitute "*take*" as defined under the Act, which would require a permit from the USFWS to conduct those types of activities.

Under 50 CFR 22.26, WS and/or an airport authority could apply for a permit allowing for the harassment of eagles that pose threats to aviation safety at civil and military airports. Under this proposed action alternative, WS could employ harassment methods to disperse eagles from airports/air bases or surrounding areas when authorized and permitted by the USFWS pursuant to the Act. Therefore, if no permit is issued by the USFWS to harass eagles that are posing a threat of aircraft strikes, no activities would be conducted by WS. Activities would only be conducted by WS when a permit allowing for the harassment of eagles has been issued to WS or to an airport authority/military installation where WS is working as a subpermittee. No lethal take of eagles would occur under this proposed action alternative.

WS would abide by all measures and stipulations provided by the USFWS in permits issued for the harassment of eagles at airports to reduce aircraft strikes. The USFWS determined that the issuance of permits allowing the "*take*" of eagles as defined by the Act would not significantly impact the human environment when permits are issued for "*take*" of eagles under the guidelines allowed within the Act (USFWS 2012). Therefore, the issuance of permits to allow for the "*take*" of eagles, including permits issued to WS or other entities has been fully evaluated in a separate analysis (USFWS 2012). Harassment at airports may benefit individual birds by preventing birds from being killed in collisions with aircraft.

Direct, Indirect, and Cumulative Effects:
WS would employ harassment methods to disperse bald eagles and remove up to two nests annually from airports, surrounding areas, to protect transmission line, transfer stations or when requested to protect human health and safety when authorized and permitted by the USFWS pursuant to the Act. Therefore, if no permit is issued by the USFWS to harass bald eagles or remove the nests of eagles that are posing a threat of aircraft strikes, Vermont's power grid or HHS no harassment or nest removal would be conducted by WS. Impacts due to nest removal and destruction should have little adverse impact on the population. Although there may be reduced fecundity for the individuals affected by nest destruction, this activity has no long term effect on breeding adults. The destruction of up to two nests by WS would not reach a level where adverse effects on eagle populations would occur. No lethal take of bald eagles would occur under this proposed action alternative. WS would abide by all measures and stipulations provided by the USFWS in permits issued for the harassment of bald eagles at airports to reduce aircraft strikes. The USFWS fully evaluated and determined that the issuance of permits for the harassment of eagles to WS or other entities would have no significant impacts in a separate analysis (USFWS 2012).

Double-Crested Cormorant Biology and Population Impacts

BCR Atlantic/Interior regional breeding population: 85,510 – 256,212[1]
BBS Atlantic Northern Forest, 1966-2013: 3.82%
BBS Atlantic Northern Forest, 2003-2013: 6.90%
BBS LGLSP, 1966-2013: 14.29%
BBS LGLSP, 1966-2013: 14.85%
[1]*Estimate nesting pair population range from Tyson et all 1999*

WS proposed take: 6,140 + 1,000 nest (and eggs)
WS removal as % of regional population: 7.1%
Cumulative removal as % of population: 7.2%

Cormorants are most commonly found in Vermont during the spring, summer, and fall months when the breeding and migrating populations are present, with peak migration numbers occurring in April and October (Wires et al. 2001, USFWS 2003). Breeding populations of cormorants in Vermont occur mostly on Lake Champlain. Cormorant removal for Lake Champlain is addressed in the draft Cormorant and Gull Damage Management on Lake Champlain EA. Other areas in Vermont with potential breeding habitat include lakes, rivers and swamps where nesting could occur on the ground or in trees.

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

Double-crested cormorants are protected under the MBTA. However, take can occur pursuant to the MBTA through depredation permits issued by the USFWS. Vermont is included in the public resource depredation order (PRDO) (50 CFR 21.48 and 50 CFR 21.47). Take of double-crested cormorants in Vermont occurs under the PRDO and USFWS permits issued to WS and under permits issued to other entities. The USFWS-authorized take of double-crested cormorants in Vermont issued to all entities is

shown in Table 4.16. Double-crested cormorant nests can also be destroyed as part of USFWS issued depredation permits to prevent and alleviate damage. The number of permits for nest destruction and the reported take are also shown in Table 4.16. The highest authorized removal for non-WS entities (35 birds) in addition to the WS proposed removal was used to assess the cumulative removal.

Table 4.16 – Number of double-crested cormorants addressed in Vermont from FY 2010 to FY 2014

		Take under Depredation Permits					
		WS Authorized Removal[1]		WS Removal[1]		Authorized Removal for Other Entities[2]	Removal by Other Entities[2]
Year	Dispersed by WS[1]	Individuals	Nests + Eggs	Individuals	Nests + Eggs	Individuals	Individuals
2010	22,579	6,140	1,000	835	367	0	0
2011	36,236	6,140	1,000	5,591	160	0	0
2012	7,255	6,140	1,000	1,633	0	0	0
2013	10,550	6,140	1,000	867	0	50	49
2014	22,191	6,140	1,000	1,495	0	50	N/A[3]
Average	**19,762**	**6,140**	**1,000**	**2,084**	**105**	**20**	**10**

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

Direct, Indirect, and Cumulative Effects:

As the number of requests for assistance increases, the number of cormorants that will be addressed by WS to alleviate damage or threats is also likely to increase. Based on the number of requests received by WS for assistance with managing damage and threats associated with cormorants and in anticipation of additional requests for assistance, WS could lethally remove up to 6,140 double-crested cormorants annually in Vermont under depredation permits and pursuant to the PRDO. In addition, up to 1,000 nests could be destroyed by WS annually to disperse nesting cormorants from areas to reduce nest site competition and to reduce habitat damage. Although the increased take of cormorants and their nests could occur where requested, the primary increase in requests for assistance is to meet the objectives outlined in the Lake Champlain Islands management plan. As the number of cormorants using the Lake (both nesting and feeding) increases, the number of cormorants addressed by WS and other entities to achieve those objectives is also likely to increase

The double-crested cormorant management FEIS developed by the USFWS predicted the number of double-crested cormorants taken by authorized entities under the selected alternative would increase (USFWS 2003). The FEIS developed by the USFWS authorizes the lethal take of up to 8.0% of the continental double-crested cormorant population or 159,636 birds annually (USFWS 2003). The USFWS determined in the FEIS analysis that this level of take would have no significant impact on regional or continental populations of cormorants (USFWS 2003, USFWS 2009). This analysis and determination included not only cormorants taken under PRDO and AQDO but also depredation permits (USFWS 2003, USFWS 2009). Additionally, nest destruction is anticipated to have minimal effects on regional or continental cormorant populations (USFWS 2003, USFWS 2009).

Nationwide, the USFWS predicted that the implementation of the AQDO (50 CFR 21.47), the PRDO, and the issuance of depredation permits would affect approximately 8% of the continental cormorant population on an annual basis (USFWS 2003). The FEIS also predicted the number of cormorants taken by authorized entities under the preferred alternative would increase by 4,140 cormorants per state, including Vermont, above the take that had occurred prior to the development of the EIS (USFWS 2003). Furthermore, the USFWS predicted that authorized take of cormorants and their eggs for the management

of double-crested cormorant damage, including those taken in Vermont, is anticipated to have no significant impact on regional or continental double-crested cormorant populations (USFWS 2003). This includes cormorants that may be killed in Vermont under the PRDO by WS, the VFWD, Native American Tribes, and those taken under USFWS and VFWD issued depredation permits

In addition to the lethal take of cormorants, nest destruction activities could also be conducted to alleviate damage and to disperse nesting cormorants from areas where nesting is adversely affecting natural resources, property, or posing a threat to human safety. Cormorants are a long-lived bird species and the destruction of nests is anticipated to have minimal effects on regional or continental cormorant populations (USFWS 2003).

Based on the best scientific data, WS proposed removal level will have no adverse direct effects on double-crested cormorant populations as combined WS take and other entities take would still be below the take level analyzed in the cormorant management FEIS. Additionally, the potential authorized removal from all non-WS entities combined with WS proposed removal is not expected to create adverse cumulative impacts. The permitting of the removal by the USFWS pursuant to the MBTA ensures removal by WS and by other entities occurs within allowable removal levels to achieve the desired population objectives for double-crested cormorants.

The removal and destruction of nests should have little adverse impact on the population. Although this method may reduce the fecundity of individual birds, nest destruction has no long term effect. The destruction of up to 1,000 double-crested cormorant nests annually by WS, in addition to nests analyzed in the Lake Champlain EA, would occur in localized areas where nesting takes place and would not reach a level where adverse effects on cormorant populations would occur. As with the lethal take of adults, the take of nests must be authorized by the USFWS. Therefore, the number of nests taken by WS annually would occur at the discretion of the USFWS.

Common Raven Biology and Population Impacts

VT population estimate: 2,000
BBS Atlantic Northern Forest, 1966-2013: 0.49%
BBS Atlantic Northern Forest, 2003-2013: 0.63%
BBS LGLSP, 1966-2013: 10.18%
BBS LGLSP, 2003-2013: 11.48%
WS proposed removal: 50 + 30 nests (and eggs)
BBS VT, 1966-2013: 5.69%
BBS VT, 2003-2013: 2.90%
WS removal as % of state population: 2.5%

Common ravens occur throughout the U.S. in a variety of habitats including forests, beaches, and agricultural fields. While they are sometimes displaced by the more common crow species, ravens are slowly re-inhabiting northeastern forests as the forests regenerate. Ravens may build nests on power-line towers, telephone poles, and billboards as they are often found near people (The Cornell Lab of Ornithology 2014).

Direct, Indirect, and Cumulative Effects:
WS' proposed annual removal is only 2.5% of the statewide population and therefore will have no adverse direct or indirect effects on raven populations. Although non-WS removal is unknown, raven populations have steadily increased and have historically expanded their range throughout North America. Therefore, WS does not anticipate any significant cumulative impacts to raven populations.

Mourning Dove Biology and Population Impacts

VT population estimate: 130,000
BBS Atlantic Northern Forest, 1966-2013: 5.14%
BBS Atlantic Northern Forest, 2003-2013: -0.24%
BBS LGLSP, 1966-2013: 1.67%
BBS LGLSP, 2003-2013: -0.53%

WS proposed removal: 500 and 100 nests (and eggs)
BBS VT, 1966-2013: 2.84%
BBS VT, 2003-2013: -1.09%
WS removal as % of state population: 0.38%
Cumulative removal as % state population: 0.38%

Mourning doves are migratory birds with substantial populations throughout much of North America and can be found in Vermont year round. Mourning doves are considered migratory game birds; however there are no established hunting seasons for doves in Vermont. Across the United States, the preliminary mourning dove harvest was estimated at almost 14.4 million doves in 2012 and 14.5 million doves in 2013 (Raftovich et al. 2014). CBC data indicates a declining population trend for doves observed wintering in Vermont (NAS 2010).

Requests for assistance often arise from airports where the gregarious flocking behavior of doves can pose risks to aircraft at or near airports. Based on the possibility of increasing need to address damage and threats associated with doves in Vermont, up to 500 mourning doves and 100 nests (and eggs) could be taken by WS annually to address damage or threats. No non-WS removal has been recorded for doves in the past several years.

Direct, Indirect, and Cumulative Effects:
Based on the best scientific data, WS proposed removal level will have no adverse direct or indirect effects on mourning dove population. This potential limited take of doves, in comparison to the overall population and the permitting take by the USFWS through the issuance of a depredation permit, should not adversely affect dove populations. Local populations of mourning doves in Vermont are likely augmented by migrating birds during the winter months. Like other native bird species, the take of mourning doves by WS to alleviate damage will only occur when permitted by the USFWS and pursuant to the MBTA through the issuance of a depredation permit. Therefore, the take of mourning doves by WS will only occur at levels authorized by the USFWS which ensures WS' take and take by all entities are considered to achieve the desired population management levels of doves in Vermont.

Barn Swallow Biology and Population Impacts

VT population estimate: 80,000
BBS Atlantic Northern Forest, 1966-2013: -5.58%
BBS Atlantic Northern Forest, 2003-2013: -5.42%
BBS LGLSP, 1966-2013: -1.50%
BBS LGLSP, 2003-2013: -1.16%

WS proposed removal: 100 and 100 nests (and eggs)
BBS VT, 1966-2013: -4.06%
BBS VT, 2003-2013: -4.36%
WS removal as % of state population: 0.125%
WS cumulative removal as % of state population: 0.125%

Barn swallows begin to arrive in Vermont in mid-April and found statewide except in high elevations of the state. They are common in agricultural areas and along rivers and lakeshores, but will also use smaller openings in forested or residential landscapes building nests in barns, bridges, porches or under the eaves of houses. The number of barn swallows addressed in Vermont by all entities is currently unknown. WS has not been requested to manage barn swallows in the past five years; however, future requests for assistance are anticipated.

Direct, Indirect, and Cumulative Effects:
Although the barn swallow population trend has been declining in Vermont since 1966, WS proposed annual removal is only a fraction of a percent of the state population. Based on the best scientific data, WS proposed removal level will have no adverse direct or indirect effects on barn swallow populations. The potential authorized removal from all non-WS entities combined with WS proposed removal is also

only a fraction of a percent of the state population and therefore it is not expected to create adverse cumulative impacts. The permitting of the removal by the USFWS pursuant to the MBTA ensures removal by WS and by other entities occurs within allowable removal levels to achieve the desired population objectives for barn swallows in Vermont.

Tree Swallow Biology and Population Impacts

VT population estimate: 90,000
BBS Atlantic Northern Forest, 1966-2013: -3.22
BBS Atlantic Northern Forest, 2003-2013: -3.18
BBS LGLSP, 1966-2013: -0.58
BBS LGLSP, 2003-2013: -1.96

WS proposed removal: 100 + 50 nests (and eggs)
BBS VT, 1966-2013: -2.34
BBS VT, 2003-2013: -2.62
WS removal as % of state population: 0.11%

Tree swallows are migratory birds found throughout much of the United States (Winkler et al. 2011). In Vermont, tree swallows are present across the state during the breeding season (Winkler et al. 2011). Tree swallows are generally thought to be associated with bodies of water including wet fields, marshes, shorelines, and wooded swamps, with a diet consisting of mostly flying insects (Winkler et al. 2011). Tree swallows are cavity nesters commonly nesting in groups when cavities are available (Winkler et al. 2011). The number of tree swallows addressed in Vermont by all entities is currently unknown. WS has not been requested to manage tree swallows in the past five years; however, future requests for assistance are anticipated.

Direct, Indirect, and Cumulative Effects:
Based on the best scientific data, WS proposed annual removal level will have no adverse direct effects on tree swallow populations. Like other native bird species, the take of tree swallows by WS to alleviate damage would only occur when permitted by the USFWS pursuant to the MBTA, through the issuance of a depredation permit. Therefore, the take of tree swallows by WS would only occur at levels authorized by the USFWS, which ensures cumulative take by all entities is considered prior to any action being conducted.

Herring Gull Biology and Population Impacts

Regional population estimate: 286,916[1]
BBS Atlantic Northern Forest, 1966-2013: -5.19%
BBS LGLSP,1966-2013: -3.93%
BBS LGLSP, 2003-2013:-2.60%
[1]*MANEM Waterbird Conservation Plan*

WS proposed removal: 500 and 100 nests (and eggs)
BBS Atlantic Northern Forest, 2003-2013: -4.49%
WS removal as % of regional population: 0.17%
Cumulative removal as % of regional population: 0.9%

The population of herring gulls in the New England/Mid-Atlantic Coast BBS region and the Atlantic Northern Forest BBS region was estimated at approximately 286,916 breeding pairs (MANEM, 2006). Herring gulls have decreased approximately 19% in the same area between 1970 and into the 1990s (MANEM, 2006). According to the MANEM Waterbird Conservation Plan (2006), herring gulls are considered a species of low concern in North America.

Herring gulls are protected under the MBTA. However, take can occur pursuant to the MBTA through depredation permits issued by the USFWS. WS' take of gulls occurs under permits issued to WS or under permits issued to cooperators where WS is acting as an agent on the permit. The USFWS-authorized take of herring gulls in Vermont issued to all entities is shown in Table 4.19. The USFWS also authorized herring gull nests to be destroyed as part of depredation permits to prevent and alleviate damage. The number of permits for nest destruction and the reported take are also shown in Table 4.19. Since 2010, no herring gull nests have been reported as destroyed in Vermont. The highest authorized

removal for non-WS entities (2,175 birds) in addition to the WS proposed removal was used to assess the cumulative removal.

Table 4.19 – Number of herring gulls addressed in Vermont from FY 2010 through FY 2014

Year	Dispersed by WS[1]	Take under Depredation Permits							
		WS Authorized Removal[1]		WS Removal[1]		Authorized Removal for Other Entities[2]		Removal by Other Entities[2]	
		Individuals	Nests + Eggs	Individuals	Nests + Eggs	Individuals	Nests + Eggs	Individuals	Nests+ Eggs
2010	0	40	40	18	0	2,160	100	42	0
2011	34	40	40	6	0	260	100	0	0
2012	34	40	40	16	0	2,175	100	43	0
2013	51	100	40	7	0	260	100	35	0
2014	19	100	40	9	0	170	100	1	0
Average	**20.8**	**64**	**40**	**11.2**	**0**	**1,005**	**100**	**24.2**	**0**

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

Direct, Indirect, and Cumulative Effects:

From 2007 through 2012, the number of herring gulls taken annually by all entities in the northeastern United States (USFWS Region 5) has ranged from 1,964 to 7,885 gulls with an average of 4,366 gulls. This average annual take of 4,366 gulls is below the level of annual take required to maintain current population levels predicted by the PBR model. To cause a population decline, the PBR model estimates that nearly 16,725 herring gulls would have to be taken annually in the region. If WS annual take reaches 500 herring gulls and the take of herring gulls remains similar to the take that occurred from 2007 through 2012 in the northeastern United States, the combined total would not reach a magnitude that the PBR model predicts would result in a decline in the population of herring gulls in BCR 14 and BCR 13. Herring gulls are a long-lived species that have the ability to identify areas with regular human disturbance and low reproductive success which causes them to relocate and nest elsewhere when confronted with repeated nest failure. Although there may be reduced fecundity for the individuals affected, this activity has no long term effect on breeding adult herring gulls. Nest removal is not used by WS as a population management method. This method is used by WS to inhibit nesting in an area experiencing damage due to nesting activity and is intended to relocate a nesting pair or colony of herring gulls to an area where there are no conflicts. The destruction of up to 100 herring gull nests (and eggs) 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.

Based on the best scientific data described above, WS' potential impacts to populations of herring gulls has been, and is expected to continue to be, insignificant to the overall viability and reproductive success of herring gull populations on a local, regional, and nationwide scale. Additionally, the potential authorized removal from all non-WS entities combined with WS proposed removal is not expected to create adverse cumulative impacts. The permitting of the removal by the USFWS pursuant to the MBTA ensures removal by WS and by other entities occurs within allowable removal levels to achieve the desired population objectives for herring gulls. This should assure that cumulative impacts on herring gull populations would have no significant adverse impact on the quality of the human environment.

Ring-billed Gull Biology and Population Impacts

Regional breeding population estimate: 1,700,000[1]
BBS Atlantic Northern Forest, 1966-2013: 4.73%
BBS Atlantic Northern Forest, 2003-2013: 7.42%
BBS LGLSP, 1966-2013: 2.71 %
BBS LGLSP, 2003-2013: 4.58 %
[1]*MANEM Waterbird Conservation Plan*

WS proposed removal: 3,000 and 1,000 nests (and eggs)
BBS VT, 1966-2013: -2.06
BBS VT, 2003-2013: -2.16
WS removal as % of regional population: 0.18%
Cumulative removal as % of regional population: 0.32%

The breeding population of ring-billed gulls is divided into two populations; the western breeding population and the eastern breeding population. The eastern breeding population includes New York, Vermont, Ohio, Illinois, Michigan, Wisconsin, and Minnesota (Blokpoel and Tessier 1986). The breeding population of ring-billed gulls in New York can be found on Lake Champlain, the St. Lawrence River, the Lower Great Lakes, and Oneida Lake (Bull 1974, Peterson 1985). Currently, there are an estimated 53,000 breeding pairs and 28 colonies in New York (McGowan and Corwin 2008).

The Mid/Atlantic/New England/Maritimes (MANEM) Region Waterbird Conservation plan gives an estimate of 1,700,000 breeders within the plan area (MANEM, 2006).

The breeding population of ring-billed gulls in Vermont has increased by over 200% since the last Breeding Bird Atlas was conducted in 1981 (Vermont Breeding Bird Atlas 2007). Young Island was historically the main colony location averaging roughly 10,000 pairs annually, with some nesting also taking place on Papasquash Island, VT and Rock Island, VT, both in Lake Champlain (Figure 4.2) (Vermont Breeding Bird Atlas 2007). Management efforts to control the ring-billed gull population on Young Island have taken place in recent years with a goal of restoring the islands natural vegetation (Vermont Breeding Bird Atlas 2007).

Ring-billed gull populations have been generally increasing in the Great Lakes region. In 1984, the population of ring-billed gulls in the Great Lakes region was estimated at approximately 648,000 pairs (Blokpoel and Tessier 1986). Blokpoel and Tessier (1992) found that the nesting population of ring-billed gulls in the Canadian portion of the lower Great Lakes system increased from 56,000 pairs to 283,000 pairs from 1976-1990.

According to the Upper Mississippi Valley/Great Lakes Waterbird Conservation Plan, which includes BCR 13, ring-billed gulls are listed as not currently at risk (Wires et al. 2010). The Bird Conservation Plan for the Lower Great Lakes/St. Lawrence Plain Bird Conservation Region (BCR 13) lists ring-billed gulls as low concern and prioritizes them as overabundant (USFWS 2007).

Table 4.20 – Number of ring-billed gulls addressed in Vermont from FY 2010 through FY 2014

Year	Dispersed by WS[1]	Take under Depredation Permits							
		WS Authorized Removal[1]		WS Removal[1]		Authorized Removal for Other Entities[2]		Removal by Other Entities[2]	
		Individuals	Nests + Eggs	Individuals	Nests + Eggs	Individuals	Nests + Eggs	Individuals	Nests+ Eggs
2010	39,325	250	1000	0	14,751	255	10,200	94	0
2011	35,260	250	1000	22	0	255	10,200	103	0
2012	51,785	700	1000	95	0	2,255	10,200	311	0
2013	20,646	700	1000	190	0	2,380	10,200	313	0
2014	28,436	700	1000	0	0	2,365	10,200	0	0
Average	**35,090.4**	**520**	**1000**	**61.4**	**2,950**	**1,502**	**10,200**	**164.2**	**0**

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

Direct, Indirect, and Cumulative Effects:
WS' potential impacts to populations of ring-billed gulls are expected to remain insignificant to the overall viability and reproductive success of this bird species population at a local, regional, and nationwide scale. With management authority over migratory birds, the USFWS could impose stricter take limits if warranted based on population data. The USFWS could impose restrictions on depredation harvest as needed to assure cumulative take does not adversely affect gull populations. Based on the best scientific data, WS proposed annual removal level will have no adverse cumulative effects on ring-billed gull populations.

Live-capture and Translocation Species

Several species within Vermont, including red-tailed hawks, Northern harriers, Northern goshawks, red-shouldered hawks, peregrine falcons, Cooper's hawks, sharp-shinned hawks, broad-wing hawks, great horned owls, barred owls, merlins, and American kestrels, have the potential to pose threats to aviation safety, and most requests WS would receive for these species would be to alleviate the threats these species pose to aircraft. In addition, wild turkeys have also been identified to pose a potential disease risk to livestock in VT by contaminating feed supplies. WS would address those requests for assistance primarily with non-lethal dispersal methods and through live-capture and translocation of individuals. Based on the requests for assistance received previously and in anticipation of receiving additional requests for assistance, WS proposes up to 30 each of Northern harriers, Northern goshawks, red-shouldered hawks, peregrine falcons, Cooper's hawks, sharp-shinned hawks, broad-wing hawks, great horned owls, and barred owls, up to 150 red-tailed hawks, up to 300 American kestrels, up to 100 merlins and up to 500 wild turkeys could be live-captured and translocated annually under the proposed action. From FY 2010 to FY 2014, WS captured and translocated a total of 55 American kestrels, 10 red-tailed hawks, and two snowy owls to alleviate threats posed to aviation safety at Vermont airports.

Lethal removal would only be conducted on these species when immediate threats to human safety occur, such as when banned individuals have returned to the same airport twice after translocation or when habituation to non-lethal methods occurs. From FY 2010 to FY 2014, WS lethally removed one American kestrel in Vermont. Based on previous requests for assistance received by WS, as well as anticipated requests, no more than 20 individuals and 20 nests (and eggs) of red-tailed hawks, Northern harriers, Northern goshawks, red-shouldered hawks, peregrine falcons, Cooper's hawks, sharp-shinned hawks, broad-wing hawks, great horned owls, barred owls, merlins, and American kestrels could be removed annually by WS.

Direct, Indirect, and Cumulative Effects:
These raptors are not expected to be removed by WS at any level that would cause adverse direct effects on the population of those species. These species listed are afforded protection under the MBTA and removal is only allowed through the issuance of a depredation permit and only at those levels stipulated in the permit. Therefore, those birds would be removed in accordance with applicable state and federal laws and regulations authorizing removal of migratory birds and their nests and eggs, including the USFWS and the VFWD permitting processes.

Although the live-capture and translocation of these species would be a non-lethal method of reducing damage or threats of damage, these species could be translocated during their nesting season which could lower nesting success. Reduced nesting success could occur by removing one of the adult pairs of any of these species. However, available information indicates that the successful raising of young could occur if only one adult was left to tend to the young. Provided most of WS' relocation will occur outside of the nesting season, and there is the ability to successfully raise young with only one parent, significant adverse indirect effects are not expected to occur to theses populations.

The USFWS, as the agency with management responsibility for migratory birds, could impose restrictions on depredation removal as needed to assure cumulative removal does not adversely affect the continued viability of populations. Since removal of these species, including live-capture and translocation, can only occur when permitted by the USFWS and VFWD pursuant to the MBTA through the issuance of depredation permits, all removal, including removal by WS, would only occur at levels authorized by the USFWS and the VFWD which ensures there are no adverse cumulative impacts on the population of these species in Vermont. This would assure that cumulative impacts on these bird populations would have no significant adverse impact on the quality of the human environment

Additional Target Species

Target species, in addition to those species analyzed previously, that have been or could be lethally removed in the future are included in Appendix C. Some of these target species have been lethally removed in small numbers by WS and have included no more than 20 individuals and/or no more than 20 nests annually. Based on previous requests for assistance, anticipation of future requests for assistance, and the removal levels necessary to alleviate those requests for assistance, no more than 20 individuals and 20 nests (and eggs) of each of those additional target species listed could be removed annually by WS. The species listed in the sections may also be captured and tested for disease surveillance.

WS will analyze the removal of osprey as an indicator of no significant direct or cumulative adverse impacts to these additional species. Osprey's represent a sensitive species included in this group based on abundance and available habitat. Therefore, if osprey are not adversely impacted by WS' removal, then no other species in this group should incur significant negative impacts to their statewide populations.

Osprey Biology and Population Impacts

VT population estimate: 300
BBS Atlantic Northern Forest, 1966-2013: 2.33%
BBS Atlantic Northern Forest, 2003-2013: 4.21%
BBS LGLSP, 1966-2013: 7.13%
BBS LGLSP, 2003-2013: 8.62%

WS proposed removal: 20 + 20 nests (and eggs)
WS removal as % of state population: 6%

Ospreys are large raptors most often associated with shallow aquatic habitats where they feed primarily on fish (Poole et al. 2002). Historically, nests of osprey were constructed on tall trees and rocky cliffs. Today, ospreys are most commonly found nesting on man-made structures such as power poles, cell

towers, and man-made nesting platforms (Poole et al. 2002). Osprey can be located throughout the year along the coastal areas of the state with breeding populations also occurring further inland (Poole et al. 2002).

Osprey were removed from Vermont's Endangered and Threatened Species list in April 2005. Higher productivity of ospreys in Vermont in recent years has occurred due to the efforts of many people and organizations including the VFWD, the U.S. Fish and Wildlife Service, and various Vermont power companies. The VFWD erected 11 new nests in 2014 in conjunction with utility companies for birds that needed to be moved because of transmission infrastructure issues. The VFWD estimates there to be approximately 150-175 active nests in the state (J. Gobielle, per. Comm.VFWD 2015).

Direct, Indirect, and Cumulative Effects:

Based on the best scientific data, WS proposed annual removal level will have no adverse direct effects on osprey populations. The take of osprey by WS would only occur when permitted and only at levels authorized on depredation permits issued by the USFWS. The permitting of the removal by the USFWS and the VFWD pursuant to the MBTA ensures removal by WS and by other entities occurs within allowable removal levels to achieve the desired population objectives for osprey. Therefore, WS does not anticipate any significant cumulative impacts to raven populations.

Summary

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

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

All those factors play a role in the dynamics of wildlife populations. In many circumstances, requests for assistance arise when some or all of those elements have contrived to elevate target species populations or place target species at a juncture to cause damage to resources. WS' actions to minimize or eliminate damage are constrained as to scope, duration and intensity, for the purpose of minimizing or avoiding impacts to the environment. WS evaluates damage occurring, including other affected elements and the dynamics of the damaging species; determines appropriate strategies to minimize effects on environmental elements; applies damage management actions; and subsequently monitors and adjusts/ceases damage management actions (Slate et al. 1992). This process allows WS to take into consideration other influences in the environment, such as those listed above, in order to avoid cumulative adverse impacts on target species.

Wildlife Disease Surveillance and Monitoring

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

interest groups.[9] Current information on disease distribution and knowledge of the mixing of birds in migratory flyways has been used to develop a prioritized sampling approach based on the major North American flyways. Surveillance data from all of those areas would be incorporated into national risk assessments, preparedness and response planning to reduce the adverse impacts of a disease outbreak in wild birds, poultry, or humans.

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

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

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

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

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

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

Direct, Indirect, and Cumulative Effects:

Under the disease sampling strategies listed above that could be implemented to detect or monitor avian diseases in the United States, WS' implementation of those sampling strategies would not create adverse direct or indirect effects on avian populations in the state. Sampling strategies that could be employed

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

involve sampling live-captured birds that could be released on site after sampling occurs. The sampling (e.g., drawing blooding, feather sample, fecal sample) and the subsequent release of live-captured birds would not result in adverse direct or indirect effects since those birds are released unharmed on site. In addition, sampling of sick, dying, or hunter harvested birds would not result in the additive lethal removal of birds that would not have already occurred in the absence of a disease sampling program. Therefore, the sampling of birds for diseases would not create adverse cumulative impacts on the populations of any of the birds addressed in this EA nor would it result in any removal of birds that would not have already occurred in the absence of disease sampling (e.g., hunter harvest).

Alternative 2 - Bird Damage Management by WS using only Non-lethal Methods

Under this alternative, WS would not use lethal methods to resolve bird damage problems. Although some unintentional mortality might result from the use of bird capture devices like mist nets, these incidents are likely to be rare and would have negligible impacts on target species populations. Individuals, agencies and organizations would still be able to obtain permits for lethal bird removal from the USFWS and VFWD. Efforts to reduce or prevent damage and risks to livestock and/or human health and safety risks would likely be higher than with Alternative 1. If BDM is conducted by individuals with limited training or experience, it is possible that additional birds may be removed in the course of attempts to resolve damage problems.

Direct, Indirect, and Cumulative Effects:
Depending upon the experience, training and methods available to the individuals conducting the BDM, potential adverse direct and indirect impacts on target bird populations would likely be the same or greater than with Alternative 1. However, for the same reasons shown under Alternative 1, it is unlikely that significant adverse direct or indirect effects would occur to target species' by implementation of this alternative. Direct and indirect impacts and potential risks of illegal toxicant use would be greater under this alternative than Alternative 1. DRC-1339 and Alpha-chloralose are currently only available for use by WS employees and would not be available under this alternative, although Starlicide, a product similar to DRC-1339 would be available for use by licensed pesticide applicators. It is possible that frustration caused by the inability to reduce damage by the public would lead to illegal use of toxicants which could increase adverse direct, indirect, or cumulative effects, however to an unknown degree. Because WS would be able to provide assistance with non-lethal BDM, risks of adverse cumulative impacts from actions by non-WS entities are lower than with Alternative 3.

Alternative 3 – No Bird Damage Management Conducted by WS

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

Direct, Indirect, and Cumulative Effects:
Local bird populations could decline, stay the same, or increase depending on actions taken by those persons experiencing bird damage. The direct and indirect effects on bird populations would be variable and unknown. Some resource/property owners may take illegal, unsafe, or environmentally harmful action against local populations of birds out of frustration or ignorance. While WS would provide no

assistance under this alternative, other individuals or entities could conduct lethal damage management resulting in direct or indirect impacts similar to the proposed action.

Since birds would still be removed under this alternative, the potential direct, indirect, and cumulative effects on the populations of those bird species would be similar among all the alternatives for this issue. WS' involvement would not be additive to removal that could occur since the cooperator requesting WS' assistance could conduct bird damage management activities without WS' direct involvement. Therefore, any actions to resolve damage or reduce threats associated with birds could occur by other entities despite WS' lack of involvement under this alternative, and therefore the cumulative impact on those bird species could be similar to Alternative 1.

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

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

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

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

WS personnel are experienced and trained in wildlife identification and to select the most appropriate methods for taking targeted animals and excluding non-target species. To reduce the likelihood of capturing non-target wildlife, WS would employ the most selective methods for the target species, would employ the use of attractants that are as specific to target species as possible, and determine placement of methods to avoid exposure to non-targets. SOPs to prevent and reduce any potential adverse impacts on non-targets are discussed in Chapter 3 of this EA. Despite the best efforts to minimize non-target removal during program activities, the potential for adverse impacts to non-targets exists when applying both non-lethal and lethal methods to manage damage or reduce threats to safety. One ruffed grouse was captured in a cage trap and released in 2010.

Direct, Indirect, and Cumulative Effects:
While every precaution is taken to safeguard against taking non-targets during operational use of methods and techniques for resolving damage and reducing threats caused by birds, the use of such methods can result in the incidental removal of unintended species. Those occurrences are rare and should not affect the overall populations of any species under the proposed action. WS' removal of non-target species during activities to reduce damage or threats to human safety associated with birds is expected to be extremely low to non-existent. WS would monitor the removal of non-target species to ensure program activities or methodologies used in bird damage management do not create direct effects on non-target populations. Methods available to resolve and prevent bird damage or threats when employed by trained, knowledgeable personnel are selective for target species. WS would annually report to the USFWS and/or the VFWD any non-target removal to ensure removal by WS is considered as part of management objectives established. The potential impacts to non-targets are similar to the other alternatives and are considered to be minimal to non-existent.

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

Other non-lethal methods available for use under this alternative include live traps, nets, nest/egg destruction, translocation, and repellents. Live traps (e.g., cage traps, walk-in traps, decoy traps) and nets restrain wildlife once captured and are considered live-capture methods. Live traps have the potential to capture non-target species. Trap and net placement in areas where target species are active and the use of target-specific attractants would likely minimize the capture of non-targets. If traps and nets are attended to appropriately, most non-targets captured can be released on site unharmed. Therefore, no direct effects are expected on non-targets.

Only those repellents registered with the EPA pursuant to the FIFRA and registered for use in the state would be recommended and used by WS under this alternative. Therefore, the use and recommendation of repellents would not have negative direct or indirect effects on non-target species when used according to label requirements. Most repellents for birds are derived from natural ingredients that pose a very low risk to non-targets when exposed to or when ingested. Two chemicals commonly registered with the EPA as bird repellents are methyl anthranilate and anthraquinone. Methyl anthranilate naturally occurs in grapes. Methyl anthranilate has been used to flavor food, candy, and soft drinks. Anthraquinone naturally occurs in plants like aloe. Anthraquinone can be used to make dye. Both products claim to be unpalatable to many bird species. Several products are registered for use to reduce bird damage containing either methyl anthranilate or anthraquinone. Formulations containing those chemicals are liquids that are applied directly to susceptible resources. Similarly, when used in accordance with the label requirements, the use of Avitrol would also not create adverse direct effects on non-targets based on restrictions on baiting locations.

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

WS would also employ and/or recommend lethal methods under the proposed action alternative to alleviate damage. Lethal methods available for use to manage damage caused by birds under this alternative would include shooting and DRC-1339. In addition, birds could be euthanized once live-

captured by other methods. Available methods and the application of those methods to resolve bird damage is further discussed in Appendix B.

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

During the migration period, eagles occur throughout the United States and parts of Mexico (Buehler 2000). Under the Bald and Golden Eagle Act, activities that could result in the "take" of eagles cannot occur unless the United States Fish and Wildlife Service allow those activities to occur through the issuance of a permit. Take could occur through purposeful take (e.g., harassing an eagle from an airport using pyrotechnics to alleviate aircraft strike hazards) or non-purposeful take (e.g., unintentionally capturing an eagle in a trap). Both purposeful take and non-purposeful take require a permit from the United States Fish and Wildlife Service (see 50 CFR 22.26, 50 CFR 22.27). In those cases where purposeful take could occur or where there is a high likelihood of non-purposeful take occurring, WS would apply for a permit for those activities.

However, routine activities conducted by WS' personnel under the proposed action alternative could occur in areas where bald eagles were present, which could disrupt the current behavior of an eagle or eagles that were nearby during those activities. As discussed previously, "take" as defined by the Bald and Golden Eagle Protection Act, include 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 those methods available under the proposed action alternative and the use patterns of those methods. The routine measures that WS conducts would not meet the definition of disturb requiring a permit for the non-purposeful take of bald 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 2012). 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. Activities, such as walking to a site, discharging a firearm, or riding an ATV along a trail, generally represent short-term disturbances to sites where those activities take place. WS would conduct activities that were located near eagle nests using the National Bald Eagle Management Guidelines (USFWS 2007). The categories that would 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 bald eagles.

A common concern regarding the use of DRC-1339 is the potential non-target risks. All label requirements of DRC-1339 would be followed to minimize non-target hazards. As required by the label,

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

By acclimating target bird species to a feeding schedule, baiting can occur at specific times to ensure bait placed is quickly consumed by target bird species, especially when large flocks of target species are present. The acclimation period allows treated bait to be present only when birds are conditioned to be present at the site and provides a higher likelihood that treated bait would be consumed by the target species, which makes it unavailable to non-targets. In addition, many bird species when present in large numbers tend to exclude non-targets from a feeding area due to their aggressive behavior and by the large number of conspecifics present at the location. Therefore, risks to non-target species from consuming treated bait only occurs when treated bait is present at a bait location. Any treated bait remaining at the location after target birds had finished feeding would be removed to avoid attracting non-targets. WS requires cooperators to remove all dead birds to the extent possible following treatment with DRC-1339.

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

The median acute lethal dose (LD_{50})[10] values for starlings, blackbirds, and magpies (Corvidae) range from one to five mg/kg (Eisemann et al. 2003). For American crows, the median acute lethal dose has been estimated at 1.33 mg/kg (DeCino et al. 1966). The acute oral toxicity (LD_{50}) of DRC-1339 has been estimated for over 55 species of birds (Eisemann et al. 2003). DRC-1339 is toxic to mourning doves, pigeons, quail (*Coturnix coturnix*), chickens and ducks (*Anas* spp.) at ≥5.6 mg/kg (DeCino et al. 1966). In cage trials, Cummings et al. (1992) found that 2% DRC-1339-treated rice did not kill savannah sparrows (*Passerculus sandwichensis*). Gallinaceous birds and waterfowl may be more resistant to DRC-1339 than blackbirds, and their large size may reduce the chances of ingesting a lethal dose (DeCino et al. 1966). Avian reproduction does not appear to be affected from ingestion of DRC-1339 treated baits until levels are ingested where toxicity is expressed (USDA 2001).

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

[10] An LD_{50} is the dosage in milligrams of material per kilogram of body weight required to cause death in 50% of a test population of a species.

Based on those concerns, the Ecological Committee on FIFRA Risk Assessment was established by the EPA to provide guidance on ecological risk assessment methods (EPA 1999). The committee report recommended to the EPA that only one definitive LD_{50} be used in toxicity screening either on the mallard or northern bobwhite and recommended further testing be conducted using the up-and-down method (EPA 1999). Many of the screening methods used for DRC-1339 prior to the establishment of EPA guidelines in 1982 used the up-and-down method of screening (Eisemann et al. 2003).

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

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

DRC-1339 is rapidly metabolized and excreted and does not bioaccumulate, which probably accounts for its low secondary hazard profile (Schafer, Jr. 1991). For example, cats, owls, and magpies would be at risk only after exclusively eating DRC-1339-poisoned starlings for 30 continuous days (Cunningham et al. 1979). No probable risk is expected to American kestrels based on the low hazard quotient value for marsh hawks used as a surrogate species (Schafer, Jr. 1970). The risk to mammalian predators from feeding on birds killed with DRC-1339 appears to be low (Johnston et al. 1999).

The risks associated with non-target animal exposure to DRC-1339 baits have been evaluated in rice fields in Louisiana (Glahn et al. 1990, Cummings et al. 1992, Glahn and Wilson 1992), poultry and cattle feedlots in several western states (Besser 1964, Ford 1967, Royall et al. 1967), ripening sunflower fields in North Dakota (Linz et al. 2000), and around blackbird staging areas in east-central South Dakota (Knutsen 1998, Linz et al. 1999, Smith 1999). Smith (1999) used field personnel and dogs to search for dead non-target animals and found no non-target carcasses that exhibited histological signs consistent with DRC-1339 poisoning. The other studies also failed to detect any non-target birds that had succumbed to DRC-1339. However, DRC-1339 is a slow-acting avicide and thus, some birds could move to areas not searched by the study participants before dying.

DRC-1339 Environmental Degradation - DRC-1339 is unstable in the environment and degrades rapidly when exposed to sunlight, heat, or ultra violet radiation and has a half-life of less than two days. DRC-1339 is highly soluble in water but does not hydrolyze and degradation occurs rapidly in water. The chemical tightly binds to soil and has low mobility. The half-life is about 25 hours, which means it is nearly 100% broken down within a week, and identified metabolites (i.e., degradation chemicals) have low toxicity. Aquatic and invertebrate toxicity is low (EPA 1995). Therefore, WS does not expect any adverse indirect effects on non-target species through chemical contamination from soil or water supplies.

Additional concerns have been raised regarding the risks to non-target wildlife associated with crows caching bait treated with DRC-1339. Crows are known to cache surplus food usually by making a small hole in the soil using the bill, by pushing the food item under the substrate, or covering items with debris (Verbeek and Caffrey 2002). Distances traveled from where the food items were gathered to where the item is cached varies, but some studies suggests crows can travel up to 100 meters (Kilham 1989) and up to 2 kilometers (Cristol 2001, Cristol 2005). Caching activities appear to occur throughout the year, but

may increase when food supplies are low. Therefore, the potential for treated baits to be carried from a bait site to surrounding areas exists as part of the food cache behavior exhibited by crows.

Several mitigating factors must be overcome for non-target risks to occur from bait cached by a crow. Those factors being: (1) the non-target wildlife species would have to locate the cached bait, (2) the bait-type used to target crows would have to be palatable or selected for by the non-target wildlife, (3) the non-target wildlife species consuming the treated bait would have to consume a lethal dose from a single bait, and (4) if a lethal dose is not achieved by eating a single treated cached bait, the non-target wildlife would have to ingest several treated baits (either from cached bait or from the bait site) to obtain a lethal dose which could vary by the species.

Summary

WS does not anticipate any adverse cumulative impacts on non-target species from the implementation of the proposed bird damage management methods. Based on the methods available to resolve bird damage and/or threats, WS does not anticipate the number of non-targets removed to reach a magnitude where declines in those species' populations would occur. Therefore, removal under the proposed action of non-targets will not create adverse cumulative effects on non-target species. DRC-1339 and alpha chloralose are currently only available for use by WS employees; therefore, no adverse cumulative impacts are expected from the use of these chemicals due to no additional contribution of these chemicals into the environment from non-WS entities. Starlicide, a product similar to DRC-1339, would be available for use by licensed pesticide applicators. However, no adverse cumulative impacts are expected because Starlicide has a similar hazard profile to DRC-1339.

The proposed bird damage management could benefit many other wildlife species that are impacted by predation or competition for resources. For example, crows are generally very aggressive nesting area colonizers and will force other species from prime nesting areas. American crows and fish crows often feed on the eggs, nestlings, and fledglings of other bird species. Fish crows are known to feed heavily on colonial waterbird eggs (McGowan 2001). This alternative has the greatest possibility of successfully reducing bird damage and conflicts to wildlife species since all available methods could possibly be implemented or recommended by WS.

T&E Species Effects

Special efforts are made to avoid jeopardizing T&E species through biological evaluations of the potential effects and the establishment of special restrictions or minimization measures. SOPs to avoid T&E effects are described in Chapter 3 of this EA.

Federally Listed Species –The current list of species designated as threatened and endangered in Vermont as determined by the USFWS was obtained and reviewed during the development of this EA. Appendix D contains the list of species currently listed in the state along with common and scientific names. Based on a review of those T&E species, WS has determined that activities conducted pursuant to the proposed action would have "No Effect" on those species listed or their critical habitats.

Alternative 2 - Bird Damage Management by WS using only Non-lethal Methods

Under this alternative, risks to non-target species from WS actions would likely be limited to the use of frightening devices, exclusionary devices, and the risks of unintentional capture of a bird in a live-capture device as outlined under Alternative 1. Although the availability of WS assistance with non-lethal BDM methods could decrease incentives for non-WS entities to use lethal BDM methods, non-WS efforts to

reduce or prevent damage could result in less experienced persons implementing bird damage management methods and lead to a greater removal of non-target wildlife.

Direct, Indirect, and Cumulative Effects:
Similar to Alternative 3, it is possible that frustration from the resource owner due to the inability to reduce losses could lead to illegal use of toxicants, or other non-specific damage management methods by others could lead to unknown direct or indirect effects to non-target species populations, including T&E species (Appendix D). Hazards to T&E species could be more variable under this alternative than Alternative 1. Potential direct or indirect effects to non-target species could therefore be greater under this alternative if methods that are less selective or toxicants that cause secondary poisoning are used by non-WS entities. Direct effects on non-targets from non-lethal methods of bird damage management conducted by WS would be similar to Alternative 1. Since WS would be able to employ non-lethal methods under this alternative, indirect effects on non-target species could occur when implementing exclusionary devices if the area is large enough, but these indirect effects are expected to be minimal. The ability to reduce negative effects caused by birds to wildlife species and their habitats, including T&E species, would be variable based upon the skills and abilities of the person implementing BDM programs. It is possible that frustration caused by the inability to reduce losses would lead to non-specific damage management methods or illegal use of toxicants by others which could increase adverse cumulative impacts, however to unknown degree. While cumulative impacts would be variable, WS does not anticipate any significant cumulative impacts from this alternative.

Alternative 3 – No Bird Damage Management Conducted by WS

Under this alternative, birds could continue to be removed under depredation permits issued by the USFWS and the VFWD, removal would continue to occur during the regulated harvest season, non-native bird species could continue to be removed without the need for a permit, blackbirds and cormorants could still be removed under the depredation orders, and Muscovy ducks could be lethally removed under the control order. Risks to non-targets and T&E species would continue to occur from those who implement bird damage management activities on their own or through recommendations by the other federal, state, and private entities. Although some risks occur from those people that implement bird damage management in the absence of any involvement by WS, those risks are likely low and are similar to those under the other alternatives.

Direct, Indirect, and Cumulative Effects:
Under this alternative, WS would not be directly involved with damage management activities. Therefore, no direct or indirect impacts to non-targets or T&E species would occur by WS under this alternative. The ability to reduce damage and threats of damage caused by birds to other wildlife species and their habitats, including T&E species, would be variable based upon the skills and abilities of the person implementing damage management actions under this alternative. The risks to non-targets and T&E species would be similar across the alternatives since most of those methods described in Appendix B would be available across the alternatives. If those methods available were applied as intended, direct, indirect, and cumulative effects to non-targets would be minimal to non-existent. If methods available were applied incorrectly or applied without knowledge of bird behavior, risks to non-target wildlife would be higher under this alternative. If frustration from the lack of available assistance causes those persons experiencing bird damage to use methods that were not legally available for use, direct, indirect, and cumulative effects on non-targets would be higher under this alternative. People have resorted to the use of illegal methods to resolve wildlife damage that have resulted in the lethal removal of non-target wildlife (e.g., White et al. 1989, USFWS 2001, FDA 2003). Therefore, adverse direct, indirect, or cumulative impacts to non-targets, including T&E species, could occur under this alternative; however WS does not anticipate any significant cumulative impacts.

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

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

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

The cooperator requesting assistance is made aware through a MOU, cooperative service agreement, inter-agency agreement, or a similar document that those methods agreed upon could potentially be used on property owned or managed by the cooperator; thereby, making the cooperator aware of the use of those methods on property they own or manage to identify any risks to human safety associated with the use of those methods.

WS would use the Decision Model to determine the appropriate method or methods that would effectively resolve the request for assistance. Those methods would be continually evaluated for effectiveness and if necessary, additional methods could be employed. Risks to human safety from technical assistance conducted by WS would be similar to those risks addressed under the other alternatives. The use of non-lethal methods as part of an integrated approach to managing damage that would be employed as part of direct operational assistance by WS would be similar to those risks addressed by the other alternatives.

Lethal methods available under the proposed action would include the use of firearms, DRC-1339, live-capture followed by euthanasia, and the recommendation that birds be harvested during the regulated hunting season established for those species by the USFWS and the VFWD. Although some formulations of the avicide DRC-1339 are restricted to use by WS only, a similar product containing the same active ingredient as DRC-1339 could be available for use as a restricted use pesticide by other entities.

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

The use of live-capture traps has also been identified as a potential issue. Live-capture traps are typically set in situations where human activity is minimal to ensure public safety. Traps rarely cause serious injury and are triggered through direct activation of the device. Live-capture traps available for birds are typically walk-in style traps where birds enter, but are unable to exit. Therefore, human safety concerns associated with live traps used to capture birds require direct contact to cause bodily harm.

Other live-capture devices, such as cannon nets, pose minor safety hazards to the public since activation of the device occurs by trained personnel after target species are observed in the capture area of the net.

Lasers also pose minimal risks to the public since application occurs directly to target species by trained personnel; thereby, limiting exposure of the public to misuse of the method.

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

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

The recommendation of repellents or the use of those repellents registered for use to disperse birds could occur under the proposed action as part of an integrated approach to managing bird damage. Those chemical repellents that would be available to recommend for use or be directly used by WS under this alternative would also be available under any of the alternatives. Therefore, risks to human safety from the recommendation of repellents or the direct use of repellents would be similar across all the alternatives. Risks to human safety associated with the use or recommendation of repellents would be similar across all the alternatives. WS' involvement, either through recommending the use of repellents or the direct use of repellents, would ensure that label requirements of those repellents are discussed with those persons requesting assistance when recommended through technical assistance or would be specifically adhered to by WS' personnel when using those chemical methods. Therefore, the risks to human safety associated with the recommendation of or direct use of repellents could be lessened through WS' participation.

Risks to human safety from the use of avicides could occur either through direct exposure of the chemical or exposure to the chemical from birds that have been lethally removed. DCR-1339 (3-chloro-p-toluidine hydrochloride) is currently registered for use only by WS to be used for bird damage management in Vermont. The mixing, drying, and storage of DRC-1339 treated bait occurs in controlled areas that are not accessible by the public. Therefore, risks to public safety from the preparation of DRC-1339 are minimal. Some risks do occur to the handlers during the mixing process from inhalation and direct exposure on the skin and eyes. Adherence to label requirements during the mixing and handling of DRC-1339 treated bait for use of personal protective equipment ensures the safety of WS' personnel handling and mixing treated bait. Therefore, risks to handlers and mixers that adhere to the personal protective equipment requirements of the label are low.

Locations where treated bait may be placed are determined based on product label requirements (*e.g.*, distance from water, specific location restrictions), the target bird species use of the site (determined through prebaiting and an acclimation period), on non-target use of the area (areas with non-target activity are not used or abandoned), and based on human safety (e.g., in areas restricted or inaccessible by the public or where warning signs have been placed). Once appropriate locations were determined, treated

baits would be placed in feeding stations or would be broadcast using mechanical methods (ground-based equipment or hand spreaders) and by manual broadcast (distributed by hand) per label requirements. Once baited using the diluted mixture (treated bait and untreated bait) when required by the label, locations would be monitored for non-target activity and to ensure the safety of the public. After each baiting session, all uneaten bait would be retrieved. The prebaiting period allows treated bait to be placed at a location only when target birds were conditioned to be present at the site and provides a higher likelihood that treated bait would be consumed by the target species, which makes it unavailable for potential exposure to humans. To be exposed to the bait, someone would have to approach a bait site and handle treated bait. If the bait had been consumed by target species or was removed by WS, then treated bait would no longer be available and human exposure to the bait could not occur. Therefore, direct exposure to treated bait during the baiting process would only occur if someone approached a bait site that contained bait and if treated bait was present, would have to handle treated bait.

Factors that minimize any risk of public health problems from the use of DRC-1339 are: 1) its use is prohibited within 50 feet of standing water and cannot be applied directly to food or feed crops (contrary to some misconceptions, DRC-1339 is not applied to feed materials that livestock can feed upon), 2) DRC-1339 is highly unstable and degrades rapidly when exposed to sunlight, heat, or ultraviolet radiation. The half-life is about 25 hours; in general, DRC-1339 on treated bait material is almost completely broken down within a week if not consumed or retrieved, 3) the chemical is more than 90% metabolized in target birds within the first few hours after they consume the bait. Therefore, little material is left in bird carcasses that may be found or retrieved by people, 4) application rates are extremely low (EPA 1995), 5) a human would need to ingest the internal organs of birds found dead from DRC-1339 to be exposed, and 6) the EPA has concluded that, based on mutagenicity (the tendency to cause gene mutations in cells) studies, this chemical is not a mutagen or a carcinogen (i.e., cancer-causing agent) (EPA 1995).

Of additional concern is the potential exposure of people to crows harvested during the regulated hunting season that have ingested DRC-1339 treated bait. The hunting season for crows occurs Friday through Monday from January 15 to April 11 and again from August 19 to October 19 with no daily harvest (bag) limit or possession limit. Under the proposed action, baiting using DRC-1339 to reduce crow damage could occur during the period of time when crows can be harvested. Although baiting could occur in rural areas during those periods, most requests for assistance to manage crow damage during the period of time when crows can be harvested occur in urban areas associated with urban crow roosts. Crows using urban communal roost locations often travel long distances to forage before returning to the roost location during the evening.

For a crow that ingested DRC-1339 treated bait to pose a potential risk to human safety to someone harvesting crows during the hunting season, a hunter would have to harvest a crow that ingested DRC-1339 treated bait and subsequently consume certain portions of the crow. The mode of action of DRC-1339 requires ingestion by crows so handling a crow harvested or found dead would not pose any primary risks to human safety. Although not specifically known for crows, in other sensitive species, DRC-1339 is metabolized and/or excreted quickly once ingested. In starlings, nearly 90% of the DRC-1339 administered dosages well above the LD_{50} for starlings was metabolized or excreted within 30 minutes of dosage (Cunningham et al. 1979). In one study, more than 98% of a DRC-1339 dose delivered to starlings could be detected in the feces within 2.5 hours (Peoples and Apostolou 1967) with similar results found for other bird species (Eisemann et al. 2003). Once death occurs, DRC-1339 concentrations appear to be highest in the gastrointestinal tract of birds, but some residue could be found in other tissue of carcasses examined (Giri et al. 1976, Cunningham et al. 1979, Johnston et al. 1999) with residues diminishing more slowly in the kidneys (Eisemann et al. 2003). However, most residue tests to detect DRC-1339 in tissues of birds have been completed using DRC-1339 dosages that far exceeded the known acute lethal oral dose for those species tested and far exceeds the level of DRC-1339 that would be

ingested from treated bait. Johnston et al. (1999) found DRC-1339 residues in breast tissue of boat-tailed grackles (*Quiscalus major*) using acute doses ranging from 40 to 863 mg/kg. The acute lethal oral dose of DRC-1339 for boat-tailed grackles has been estimated to be ≤ 1 mg/kg, which is similar to the LD_{50} for crows (Eisemann et al. 2003). In those boat-tailed grackles consuming a trace of DRC-1339 up to 22 mg/kg, no DRC-1339 residues were found in the gastrointestinal track nor found in breast tissue (Johnston et al. 1999).

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

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

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

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

The recommendation by WS that birds be harvested during the regulated hunting season, which is established by the VFWD under frameworks determined by the USFWS, would not increase risks to human safety above those risks already inherent with hunting those species. Recommendations of allowing hunting on property owned or managed by a cooperator to reduce bird populations, which could then reduce damage or threats would not increase risks to human safety. Safety requirements established by the VFWD for the regulated hunting season would further minimize risks associated with hunting.

Although hunting accidents do occur, the recommendation of allowing hunting to reduce localized populations of birds would not increase those risks.

Direct, Indirect, and Cumulative Effects:
No adverse direct or indirect effects to human safety have occurred from WS' use of methods to alleviate bird damage from FY 2010 through FY 2014. The risks to human safety from the use of non-lethal and lethal methods, when used appropriately and by trained personnel, is considered low. No adverse direct effects to human health and safety are expected through the use of live-capture traps and devices or other non-lethal methods. Since WS personnel are required to complete and maintain firearms safety training, no adverse direct effects to human health and safety are expected as a result of the misuse of firearms by WS personnel. Additionally, all WS personnel are properly trained on all chemicals handled and administered in the field, ensuring their safety as well as the safety of the public. Therefore, adverse direct effects to human health and safety from chemicals used by WS are anticipated to be very low. The amount of chemicals used or stored by WS and cooperating agencies would be minimal to ensure human safety. No adverse indirect effects are anticipated from the application of any of the chemicals available for WS. According to the hazard profile for DCR-1339, it is not likely to cause contaminant of the water supply, especially when used in accordance to label requirements. Based on potential use patterns, the chemical and physical characteristics of the above mentioned toxicants and repellents, and factors related to the environmental fate, no cumulative impacts are expected from the chemical components used or recommended by the WS program in Vermont. Since DCR-1339 and alpha chloralose are only available to WS and Starlicide, which is available to licensed pesticide applicators, has a similar hazard profile to DCR-1339, WS does not anticipate any adverse cumulative impacts to human health and safety from the use of these chemicals. Since the VFWD requires hunter and trapper safety training for all sportsmen, WS does not expect any additional adverse cumulative impacts to human safety from the use of firearms when recommending that birds be harvested during regulated hunting seasons to help alleviate damage.

Alternative 2 - Bird Damage Management by WS using only Non-lethal Methods

Under this alternative, WS would not use lethal BDM methods. Concerns about human health risks from WS' use of lethal bird damage management methods would be alleviated because no such use would occur. However, Avitrol and the toxicant "Starlicide" which has the same active ingredient as DRC-1339 would be available to licensed pesticide applicators. Benefits to the public from WS BDM activities will depend on the ability of WS to resolve problems using non-lethal methods and the effectiveness of non-WS BDM efforts. In situations where risks to human health and safety from birds cannot be resolved using nonlethal methods, benefits to the public will depend on the efficacy of non-WS use of lethal BDM methods. If lethal BDM programs are implemented by individuals with less experience than WS, they may not be able to effectively resolve the problem or it may take longer to resolve the problem than with a WS program.

Direct, Indirect, and Cumulative Effects:
Since most methods available to resolve or prevent bird damage or threats are available to anyone, the direct, indirect, and cumulative effects to human safety from the use of those methods are similar between the alternatives. Private efforts to reduce or prevent damage would be expected to increase, and would likely result in less experienced persons implementing chemical or other damage management methods which may have variable adverse direct, indirect, and/or cumulative effects to human and pet health and safety than under Alternative 1. Ignorance and/or frustration caused by the inability to reduce losses could lead to illegal use of toxicants by others which could lead to unknown direct, indirect, and/or cumulative impacts to humans and pets. DRC-1339 and alpha chloralose would not be available under this alternative to non-WS entities experiencing damage or threats from birds and WS would not use DCR-1339 under this alternative since it is lethal, therefore no cumulative impacts to human health and safety should occur from these chemicals.

Alternative 3 – No Bird Damage Management Conducted by WS

Under the no bird damage management alternative, WS would not be involved with any aspect of managing damage associated with birds, including technical assistance. Due to the lack of involvement in managing damage caused by birds, no impacts to human safety would occur directly from WS. This alternative would not prevent those entities experiencing threats or damage from birds from conducting damage management activities in the absence of WS' assistance. Many of the methods discussed in Appendix B would be available to those persons experiencing damage or threats and could be used to remove birds if permitted by the USFWS and/or the VFWD. The direct burden of implementing permitted methods would be placed on those experiencing damage.

Direct, Indirect, and Cumulative Effects:
Since most methods available to resolve or prevent bird damage or threats are available to anyone, the adverse direct, indirect, and cumulative effects to human safety from the use of those methods are similar between the alternatives. Non-chemical methods available to alleviate or prevent damage associated with birds generally do not pose risks to human safety. Since most non-chemical methods available for bird damage management involve the live-capture or harassment of birds, those methods are generally regarded as posing minimal adverse direct and indirect effects to human safety. Habitat modification and harassment methods are also generally regarded as posing minimal adverse direct and indirect effects to human safety. Although some risks to safety are likely to occur with the use of pyrotechnics, propane cannons, and exclusion devices, those risks are minimal when those methods are used appropriately and in consideration of human safety. DRC-1339 and alpha chloralose would not be available under this alternative to those experiencing damage or threats from birds, therefore no adverse direct, indirect, or cumulative impacts to human health and safety should occur from these chemicals. The only methods that would be available under this alternative that would involve the direct lethal taking of birds are shooting, publicly available pesticides and repellents, and nest destruction. Under this alternative, shooting and nest destruction would be available to those persons experiencing damage or threats of damage when permitted by the USFWS and the VFWD. Firearms, when handled appropriately and with consideration for safety, pose minimal risks to human safety. However, methods employed by those persons not experienced in the use of methods or are not trained in their proper use, could increase the adverse direct, indirect, and/or cumulative impacts to human safety. Overall, the methods available to the public, when applied correctly and appropriately, pose minimal risks to human safety.

Issue 4 - Effects on the Aesthetic Values of Birds

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

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

Under the proposed action, methods would be employed that would result in the dispersal, exclusion, or removal of individuals or small groups of birds to resolve damage and threats. In some instances where birds are dispersed or removed, the ability of interested persons to observe and enjoy those birds would likely temporarily decline. Even the use of exclusionary devices can lead to the dispersal of wildlife if the resource being damaged was acting as an attractant. Thus, once the attractant has been removed or made unavailable, the wildlife would likely disperse to other areas where resources are more available.

The use of lethal methods would result in temporary declines in local populations resulting from the removal of birds to address or prevent damage and threats. The goal under the proposed action is to respond to requests for assistance and to manage those birds responsible for the resulting damage. Therefore, the ability to view and enjoy birds would remain if a reasonable effort is made to locate birds outside the area in which damage management activities occurred. Those birds removed by WS are those that could be removed by the person experiencing damage.

All activities are conducted where a request for assistance has been received and only after agreement for such services have been agreed upon by the cooperator. Some aesthetic value would be gained by the removal of birds and the return of a more natural environment, including the return of native wildlife and plant species that may be suppressed or displaced by high bird densities.

Direct, Indirect, and Cumulative Effects:
Since those birds removed by WS under this alternative could be removed with a depredation permit issued by the USFWS, under depredation orders, under control orders, without the need for a permit (non-native species), or the regulated hunting seasons, WS' involvement in taking those birds would not likely be additive to the number of birds that could be removed in the absence of WS' involvement. WS' removal of birds from FY 2010 through FY 2014 has been of low magnitude compared to the total mortality and populations of those species. WS' activities are not likely additive to the birds that would be removed in the absence of WS' involvement. Given the limited removal proposed by WS under this alternative when compared to the known sources of mortality of birds, WS' bird damage management activities conducted pursuant to the proposed action is not expected to cause adverse direct or indirect effects on the aesthetic value of birds. However, WS involvement could lead to positive indirect effects resulting in the return of additional native bird species that otherwise would not be there, which would increase the enjoyment of viewing the birds. The impact on the aesthetic value of birds and the ability of the public to view and enjoy birds under the proposed action would be similar to the other alternatives and is likely insignificant.

When damage caused by birds has occurred, any removal of birds by the property or resource owner would likely occur whether WS was involved with taking the birds or not. Therefore, the activities of WS are not expected to have any adverse cumulative impacts on this element of the human environment if occurring at the request of a property owner and/or manager. No significant cumulative impact is expected because the bird populations are a renewable resource and therefore will be replaced with new birds in the following years. The purpose of WS involvement is to alleviate the damage caused by the bird, not to eradicate the species.

Alternative 2 - Bird Damage Management by WS using only Non-lethal Methods

Under this alternative, WS would not conduct any lethal BDM, but may conduct harassment of birds that are causing damage. Other non-lethal methods may be conducted as well under this alternative to help alleviate damage caused by birds.

Direct, Indirect, and Cumulative Effects:
Although WS would not perform any lethal activities under this alternative, other private entities would likely conduct BDM activities similar to those that would no longer be conducted by WS, which means the direct and indirect effects would then be similar to the Proposed Action Alternative. Cumulative impacts are expected to be similar to Alternative 1 as well.

Assuming property owners would choose to allow and pay for the implementation of non-lethal methods by WS, this alternative could result in birds relocating to other sites where they would likely cause or

aggravate similar problems for other property owners. Thus, this alternative would likely result in more property owners experiencing adverse direct and/or indirect effects on the aesthetic values of their properties than the Proposed Action Alternative. If WS is providing direct operational assistance in relocating such birds, coordination with local authorities may be conducted to assure they do not re-establish in other undesirable locations.

Alternative 3 – No Bird Damage Management Conducted by WS

Under the no bird damage management by WS alternative, the actions of WS would have no impact on the aesthetic value of birds. Those persons experiencing damage or threats from birds would be responsible for researching, obtaining, and using all methods as permitted by federal, state, and local laws and regulations. The degree to which damage management activities would occur in the absence of assistance by any agency is unknown but likely lower compared to damage management activities that would occur where some level of assistance was provided. Birds could still be dispersed or removed under this alternative by those persons experiencing damage or threats of damage. Removal could also occur during the regulated harvest season, pursuant to the blackbird and cormorant depredation orders, pursuant to the Muscovy duck control order, and in the case of non-native species, removal could occur any time without the need for a depredation permit.

Direct, Indirect, and Cumulative Effects:
The potential direct and indirect effects on the aesthetic values of birds could be similar to the proposed action if similar levels of damage management activities are conducted by those persons experiencing damage or threats or is provided by other entities. If no action is taken or if activities are not permitted by the USFWS and the VFWD, then no direct or indirect effect on the aesthetic value of birds would occur under this alternative.

Since birds could continue to be removed under this alternative, despite WS' lack of involvement, the ability to view and enjoy birds would likely be similar to the other alternatives. The lack of WS' involvement would not lead to a reduction in the number of birds dispersed or removed since WS' has no authority to regulate removal or the harassment of birds. The USFWS and the VFWD with management authority over birds would continue to adjust all removal levels based on population objectives for those bird species. Therefore, the number of birds lethally removed annually through hunting, under the depredation/control orders, and pursuant to depredation permits are regulated and adjusted by the USFWS and the VFWD. The cumulative impacts to the aesthetic value of birds would be similar to the other alternatives.

Summary
No significant cumulative environmental impacts are expected from any of the proposed actions analyzed in this supplement. Under the Current/Proposed Action, the lethal removal of birds by WS has not and would not have a significant impact on overall bird populations in Vermont or nationwide, but some local reductions may occur. No risk to public safety is expected when WS' services are provided and accepted by continuing the BDM program with the included supplemental actions since only trained and experienced wildlife biologists/specialists would conduct and recommend bird damage management activities. Although some persons will likely be opposed to WS' participation in bird damage management activities on public and private lands, the analysis in this EA indicates that WS integrated bird damage management program would not result in significant adverse cumulative impacts on the quality of the human environment.

CHAPTER 5 - LIST OF PREPARERS AND PERSONS CONSULTED

5.1 List of Preparers/Reviewers

USDA-APHIS-Wildlife Services:
David Allaben, State Director
Jacob Borgeson, Wildlife Biologist
Chris Croson, Staff Wildlife Biologist
Fred Pogmore, Wildlife Biologist/ District Supervisor
Owen Montgomery, Biological Science Technician

5.2 List of Persons Consulted

USFWS:
Pam Carota, Migratory Bird Permits-Region 5

VAAFM:

Cary Guiguere	Vermont Agency of Agriculture, Food and Markets

VFWD:

John Gobeille	Vermont Fish and Wildlife Department
Amy Alfieri	Vermont Fish and Wildlife Department
Jon Kart	Vermont Fish and Wildlife Department
David Sausville	Vermont Fish and Wildlife Department
Steve Parren	Vermont Fish and Wildlife Department
John Buck	Vermont Fish and Wildlife Department
Jason Batchelder	Vermont Fish and Wildlife Department Law Enforcement Division
Mark Scott	Vermont Fish and wildlife Department

VTrans:

Guy Rouelle	Vermont Agency of Transportation

APPENDIX A

LITERATURE CITED

Adams, C. E., K. J. Lindsey, and S. J. Ash. 2006. Urban wildlife management. Taylor and Francis Press, Boca Raton, Florida, USA.

Allan J. R., J. S. Kirby, and C. J. Feare. 1995. The biology of Canada geese *Branta canadensis* in relation to the management of feral populations. Wildl. Bio. 1:129-143.

Allen, H. A., D. Sammons, R. Brinsfield, and R. Limpert. 1985. The effects of Canada goose grazing on winter wheat: an experimental approach. Proc. 2nd Eastern Wildl. Damage Control Conf. 2:135-141.

APHIS. 2015. Exotic Newcastle Disease, Biosecurity for Wild Birds, Pet Birds and Poultry, Avian Influenza - Animal and Plant Inspection Service. (n.d.). Accessed online March 4, 2015: http://www.aphis.usda.gov/animal_health/birdbiosecurity/end/

Apostolou, A. 1969. Comparative toxicity of the avicides 3-chloro-*p*-toluidine and 2-chloro-4-acetotoluidide in birds and mammals. Ph.D. Dissertation, Univ. of California-Davis. 178pp.

Arhart, D. K. 1972. Some factors that influence the response of European Starlings to aversive visual stimuli. M.S. Thesis, Oregon State University, Corvallis, Oregon.

Associated Press. 2014. Bacteria levels reach record high at Buckeye Lake. Accessed August 11, 2014: http://www.wbtw.com/story/26035751/bacteria-levels-reach-record-high-at-buckeye-lake.

Atlantic Flyway Council. 1999. Atlantic Flyway resident Canada goose management plan. 42 pp.

Atlantic Flyway Council. 2003. Atlantic Flyway Mute Swan Management Plan 2003 to 2013. Prepared by the Snow Goose, Brant, and Swan Committee Atlantic Flyway Technical Section. Accessed online April, 30 2012: http://www.michigan.gov/documents/dnr/AFC_mute_swan_plan1_364878_7.pdf.

Atlantic Flyway Council. 2011. Canada Goose Committee-Atlantic Flyway Game Bird Technical Section. 2011. Atlantic Flyway Resident Population Canada Goose Management Plan. Adopted by the Atlantic Flyway Council.

Avery, Michael L., J. W. Nelson, M.A. Cone. 1991. Survey of Bird Damage to Blueberries in North America. Fifth Eastern Wildlife Damage Control Conference, University of Nebraska-Lincoln. http://digitalcommons.unl.edu/ewdcc5/2/

AVMA 2001. 2000 report of the panel on euthanasia. Journal of the American Veterinary Medical Association. 218:669-696.

AVMA. 2007. AVMA guidelines on euthanasia. American Veterinary Medical Association. http://www.avma.org/issues/animal_welfare/euthanasia.pdf. Accessed on February 2, 2009.

AVMA. 2013. AVMA guidelines on euthanasia. American Veterinary Medical Association. Accessed online December 23, 2013: https://www.avma.org/KB/Policies/Documents/euthanasia.pdf.

Beason, R. C. 1995. Horned Lark. The Birds of North America, No. 195.

Beaver, B. V., W. Reed, S. Leary, B. McKiernan, F. Bain, R. Schultz, B. T. Bennett, P. Pascoe, E. Shull, L. C. Cork, R. Franis-Floyd, K. D. Amass, R. Johnson, R. H. Schmidt, W. Underwood, G. W. Thorton, and B. Kohn. 2001. 2000 Report of the AVMA Panel on Euthanasia. J. Am. Vet. Med. Assoc. 218:669-696.

Bedard, J., A. Nadeau, and M. Lepage. 1995. Double-crested cormorant culling in the St. Lawrence River Estuary. Colonial Waterbirds 18 (Spec. Pub. 1): 78-85.

Belant, J. L., T. W. Seamans, L. A. Tyson, and S. K. Ickes. 1996. Repellency of methyl anthranilate to pre-exposed and naive Canada geese. J. Wildl. Manage. 60:923-928.

Besser, J. F. 1964. Baiting starlings with DRC-1339 at a large cattle feedlot, Ogden, Utah, January 21 - February 1, 1964. U.S. Fish and Wildlife Service, Denver Wildl. Res. Ctr., Denver, CO. Suppl. Tech. Rep. Work Unit F9.2.

Besser, J. F. 1985. A grower's guide to reducing bird damage to U.S. agricultural crops. Bird Damage Research Rep. No. 340. U.S. Fish and Wildlife Service, Denver Wildl. Res. Center. 84 pp.

Besser, J. F., W. C. Royal, and J. W. DeGrazio. 1967. Baiting European starlings with DRC-1339 at a cattle feedlot. J. Wildl. Manage. 3:48-51.

Besser, J. F., J. W. DeGrazio, and J. L. Guarino. 1968. Costs of wintering European starlings and red-winged blackbirds at feedlots. J. Wildl. Manage. 32:179-180.

Bishop, R. C. 1987. Economic values defined. Pp. 24 -33 *in* D. J. Decker and G. R. Goff, eds. Valuing wildlife: economic and social perspectives. Westview Press, Boulder, CO. 424 pp.

Blackwell, B. F., G. E. Bernhardt, and R. A. Dolbeer. 2002. Lasers as non-lethal avian repellents. J. Wildl. Manage. 66:250-258.

Blankespoor, H. D., and R. L. Reimink. 1991. The control of swimmer's itch in Michigan: past, present and future. Michigan Academ. XXIV. p. 7-23.

Blokpoel, H., and G. D. Tessier. 1986. The ring-billed gull in Ontario: a review of a new problem species. Occasional Paper Number 57. Canadian Wildlife Service. Ottawa, Ontario. 34pp.

Blokpoel, H., and W.C. Scharf. 1991. The ring-billed gull in the Great Lakes of North America. Acta Congr. Int. Ornithol. 20:2372-2377.

Blokpoel, H., and G.D. Tessier. 1992. Control of ring-billed gulls and herring gulls nesting at urban and industrial sites in Ontario, 1987-1990. Proceedings of the Eastern Wildlife Damage Conference 5:51-57.

Bomford, M. 1990. Ineffectiveness of a sonic device for deterring European Starlings. Wild. Soc. Bull. 18:151-156.

Boyd, F. L., and D. I. Hall. 1987. Use of DRC-1339 to control crows in three roosts in Kentucky and Arkansas. 3rd E. Wildl. Damage Control Conf. 3:3-7.

Brauning, D. W., ed. 1992. Atlas of breeding birds in Pennsylvania. Univ. Pittsburgh Press, Pittsburgh, Pa. 484 pp.

Bruce, R. D. 1985. An Up-and-Down procedure for acute toxicity testing. Fundamentals of Applied Toxicology. 5:151-157.

Bruce, R. D. 1987. A confirmatory study of the up-and-down method for acute oral toxicity testing. Fundamentals of Applied Toxicology. 8:97-100.

Buehler, D. A. 2000. Bald eagle (*Haliaeetus leucocephalus*) *in* A. Poole and F. Gill, editors. The Birds of North America, The Academy of Natural Sciences, Philadelphia, Pennsylvania, and The American Ornithologists' Union, Washington, D.C., USA.

Capen, D. E, and D. B. Bryant. 2012. Final Report: Adaptive Management of Double-crested Cormorants on Four Brothers Islands. July 2012. The Lake Chaplin Basin Program, Grand Isle, VT.

Carlson, J. C., A. B. Franklin, D. R. Hyatt, S. E. Pettit, and G. M. Linz. 2011. The role of starlings in the spread of *Salmonella* within concentrated animal feeding operations. Journal of Applied Ecology. 48:479-486.

CDFG (California Department of Fish and Game). 1991. California Department of Fish and Game. Final Environmental Document - Bear Hunting. Sections 265, 365, 366, 367, 367.5. Title 14 Calif. Code of Regs. Cal F&G, State Of California, April 25, 1991. 13pp.

Clark, S. L. and R. L. Jarvis. 1978. Effects of winter grazing by geese on yield of ryegrass seed. Wildl. Soc. Bull. 6:84-87.

Clark, S. L., and R. L. Jarvis. 1978. Effects of winter grazing by geese on yield of ryegrass seed. Wildl. Soc. Bull. 6:84-87.

Cleary, E. C. 1994. Waterfowl. Pp E-129-E-138 *in* S.E. Hygnstrom, R.M. Timm, and G.E. Larson, eds. Prevention and Control of Wildlife Damage. University of Nebraska Cooperative Extension Service, Lincoln, Nebraska.

Cleary, E. C., R. A. Dolbeer, and S. E. Wright. 2005. Wildlife strikes to civil aircraft in the United States, 1990–2004. U.S. Dept. of Trans., Federal Aviation Admin., Serial Report No. 11 DOT/FAA/AS/00-6 (AAS-310). Washington DC. 53 pp.

Conover, M. R. 1982. Evaluation of behavioral techniques to reduce wildlife damage. Proc. Wildl.-Livestock Relation. Sym. 10:332-344.

Conover, M. R. 1988. Effect of grazing by Canada geese on the winter growth of rye. J. Wildl. Manage. 52:76-80.

Conover, M. R., W. C. Pitt, K. K. Kessler, T. J. Dubow, and W. A. Sanborn. 1995. Review of human injuries, illnesses and economic-based losses caused by wildlife in the United States. Wildl. Soc. Bull. 23:407-414.

Craig, J. R., J. D. Rimstidt, C. A. Bonnaffon, T. K. Collins, and P. F. Scanlon. 1999. Surface water transport of lead at a shooting range. Bull. Environ. Contam. Toxicol. 63:312–319.

Cristol, D. A. 2001. American crows cache less-preferred walnuts. Animal Behaviour. 62:331-336.

Cristol, D. A. 2005. Walnut-caching behavior of American crows. J. Field Ornithology. 76:27-32.

Cummings, J. L., P. A. Pochop, J. E. Davis, Jr., and H. W. Krupa. 1995. Evaluation of Rejex-It AG-36 as a Canada goose grazing repellent. J. Wildl. Manage. 59:47-50.

Cummings, J. L., Glahn, J. E., Wilson, E. A., Davis Jr., J. E., Bergman, D. L., Harper, G.A. 1992. Efficacy and non-target hazards of DRC-1339 treated rice baits used to reduce roosting populations of depredating blackbirds in Louisiana. National Wildlife Research Control Report 481. 136 pp.

Cunningham, D. J., E. W. Schafer, Jr. and L. K. McConnell. 1981. DRC-1339 and DRC-2698 residues in European Starlings: preliminary evaluation of their effects on secondary hazard potential. Proc. Bird Control Semin. 8:31-37.

Cunningham, D. J. Cunningham, E. W. Schafer, Jr., and L. K. McConnell. 1979. DRC-1339 and DRC-2698 residues in starlings: preliminary evaluation of their secondary hazard potential. Proc. Bird Control Semin. 8 (1979). pp. 31–37.

Cuthbert, F.J., Wires, L.R., McKearnan, J.E. 2002. Potential impacts of nesting double-crested cormorants on great blue herons and black-crowned night herons in the U.S. Great Lakes Region. Journal of Great Lakes Research 28: 145-154.

Davidson, W. R. and V. F. Nettles. 1997. Field manual of wildlife diseases in the southeastern United States. Southeastern Cooperative Wildlife Disease Study. Athens, Georgia. 417 pp.

Day, G. I., S. D. Schemnitz, and R. D. Taber. 1980. Capturing and marking wild animals. Pp. 61-88 *in* Wildlife management techniques manual, S.D. Schemnitz ed., The Wildlife Society, Inc. Bethesda, MD. 686 pp.

DeCino, T. J., D. J. Cunningham, and E. W. Schafer, Jr. 1966. Toxicity of DRC-1339 to European starlings. J. Wildl. Manage. 30:249-253.

Decker, D. J., and L.C. Chase. 1997. Human dimensions of living with wildlife—a management challenge for the 21st century. Wildl. Soc. Bull. 25:788–795.

Decker, D. J., and G. R. Goff. 1987. Valuing wildlife: Economic and social perspectives. Westview Press. Boulder, Colorado. 424 pp.

Decker, D. J., and K. G. Purdy. 1988. Toward a concept of wildlife acceptance capacity in wildlife management. Wildl. Soc. Bull. 16:53-57

DeHaven, R. W., and J. L. Guarino. 1969. A nest box trap for European starlings. Bird Banding. 40:49-50.

DeVault, T. L., R. B. Chipman, S. C. Barras, J. D. Taylor, C. P. Cranker III, E. M. Cranker, J. F. Farquhar. 2012. Reducing impacts of Double-crested cormorants to natural resources in central New York: A review of a collaborative research, management, and monitoring program. Waterbirds, 2012, 35 (Suppl. 1), 50-55.

DeVault, T. L., P. M. Schmidt, F. E. Pogmore, J. Gobeille, J. L. Belant. 2014. Influence of egg oiling on colony presence of ring-billed gulls. Human-Wildlife Interactions 8 (1): 22-30 Spring 2014.

Dixon, W. J., and A. M. Mood. 1948. A method for obtaining and analyzing sensitive data. J. Am. Stat. Assoc. 43:109-126.

Dolbeer, R. A. 2000. Birds and aircraft: fighting for airspace in crowded skies. Proc. Vert. Pest Conf. 19:37-43.

Dolbeer, R. A., P. P. Woronecki, and R. L. Bruggers. 1986. Reflecting tapes repel blackbirds from millet, sunflowers, and sweet corn. Wildl. Soc. Bull. 14:418-425.

Dolbeer, R. A., J. L. Belant, and L. Clark. 1993. Methyl anthranilate formulations to repel birds from water at airports and food at landfills. Proc. Great Plains Wildl. Damage Contr. Workshop. 11:42-52.

Dolbeer, R. A., S. E. Wright, and E. C. Cleary. 2000. Ranking the hazard level of wildlife species to aviation. Wildl. Soc. Bull. 28:372-378.

Dolbeer, R. A., P. P. Woronecki, A. R. Stickley, Jr., and S. B White. 1978. Agricultural impact of winter population of blackbirds and starlings. Wilson Bull. 90:31-44.

Dolbeer, R. A., L. Clark, P. P. Woronecki, and T.W. Seamans. 1992. Pen tests of methyl anthranilate as a bird repellent in water. Proc. East. Wildl. Damage Control Conf. 5:112-116.

Dolbeer, R. A., T. W. Seamans, B. F. Blackwell, and J. L. Belant. 1998. Anthraquinone formulation (Flight Control) shows promise as avian feeding repellent. J. Wildl. Manage. 62:1558-1564.

Drilling N., R. Titman, and F. McKinney. 2002. Mallard (*Anas platyrhynchos) in* A. Poole and F. Gill, editors. The Birds of North America, The Academy of Natural Sciences, Philadelphia, Pennsylvania, and The American Ornithologists' Union, Washington, D.C., USA.

Economic Perspectives Website, 2015. http://www.anr.state.vt.us

Eisemann, J. D., P. A. Pipas, and J. L. Cummings. 2003. Acute and chronic toxicity of compound DRC-1339 (3-chloro-4-methylaniline hydrochloride) to birds. Pp. 24-28 in G. M. Linz, editor. Proceedings of symposium on management of North American blackbirds. U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Services, National WildlifeResearch Center, Fort Collins, Colorado, USA.

EPA. 1982. Avian single-dose oral LD_{50} test, Guideline 71-1. Pp. 33-37 *in* Pesticide assessment guidelines, subdivision E, hazard evaluation wildlife and aquatic organisms. U. S. Environmental Protection Agency PB83-153908, Washington, D.C.

EPA. 1995. R.E.D. Facts - Starlicide (3-chloro-p-toluidine hydrochloride). U.S. Environmental Protection Agency, Prevention, Pesticides and Toxic Substances. EPA-738-F-96-003. 4 pp.

EPA. 1999. ECOFRAM terrestrial draft report. Ecological Committee on FIFRA Risk Assessment Methods. U.S. Environmental Protection Agency, Washington, D. C. Accessed online February 11, 2013: http://www.epa.gov/oppefed1/ecorisk/terreport.pdf.

EPA. 2012. Recreational Water Quailty Criteria. Office of Water. 820-F-12-058.

FDA. 2003. Bird poisoning of federally protected birds. Office of Criminal Investigations. Enforcement Story 2003.

Feare, C. 1984. The Starling. Oxford University Press. Oxford, New York.

Felsenstein, W. C., R. P. Smith, and R. E. Gosselin. 1974. Toxicological studies on the avicide 3-chloro-ptoluidine. Toxicology and Applied Pharmacology. 28:110-1125.

Fitzwater, W. D. 1994. House sparrows. Pp. E101–108 *in* S. E. Hygnstrom, R. E. Timm, and G. E. Larson, editors. Prevention and Control of Wildlife Damage. University of Nebraska, Lincoln, Nebraska, USA. Accessed online January 28, 2013: http://digitalcommons.unl.edu/icwdmhandbook/.

Fledger, E. J. Jr., H. H. Prince, and W. C. Johnson. 1987. Effects of grazing by Canada geese on winter wheat yield. Wildl. Soc. Bull. 15:402-405.

Forbes, J. E. 1995. European Starlings are expensive nuisance on dairy farms. Ag. Impact. 17:4.

Ford, H. S. 1967. Winter starling control in Idaho, Nevada, Oregon. Proc.3rd Vertebr. Pest Conf. 3:104-110.

Fuller-Perrine, L. D., and M. E. Tobin. 1993. A method for applying and removing bird exclusion netting in commercial vineyards. Wildl. Soc. Bull. 21:47-51.

Gallien, P., and M. Hartung. 1994. Escherichia coli O157:H7 as a food borne pathogen. Pp. 331-341 *in* Handbook of zoonoses. Section A: bacterial, rickettsial, chlamydial, and mycotic. G. W. Beran and J. H.Steele, eds. CRC Press. Boca Raton.

Gamble, L. R., K. M. Johnson, G. Linder, and E. A. Harrahy. 2003. The Migratory Bird Treaty Act and concerns for nontarget birds relative to spring baiting with DRC-1339. Pp. 8-12 *in* G.M. Linz, ed. Management of North American blackbirds. National Wildlife Research Center, Fort Collins, Colorado.

Giri, S. N., D. H. Gribble, and S. A. Peoples. 1976. Distribution and binding of radioactivity in starlings after IV administration of 14C 3-chloro-p-toluidine. Federation Proceedings. 35:328.

Glahn, J. F. 1983. Blackbird and starling depredations at Tennessee livestock farms. Proc. Bird Control Semin. 9:125-134.

Glahn, J. F., and D. L. Otis. 1981. Approach for assessing feed loss damage by European Starlings at livestock feedlots. Pp. 38–45 *in* Vertebrate Pest Control and Management Materials: Third

Conference, Special Technical Bulletin 752. E. W. Schaefer, Jr., and C. R. Walker, editors. American Society for Testing and Materials, West Conshohocken, Pennsylvania, USA.

Glahn, J. F., and D. L. Otis. 1986. Factors influencing blackbird and European Starling damage at livestock feeding operations. J. Wildl. Manage. 50:15-19.

Glahn, J. F., and E. A. Wilson. 1992. Effectiveness of DRC-1339 baiting for reducing blackbird damage to sprouting rice. Proc. East. Wildl. Damage Cont. Conf. 5:117-123.

Glahn, J. F., S. K. Timbrook, and D. J. Twedt. 1987. Temporal use patterns of wintering European Starlings at a southeastern livestock farm: implications for damage control. Proc. East. Wildl. Damage Control Conf. 3:194-203.

Glahn, J. F., Wilson. E. A.. Avery. M. L. 1990. Evaluation of DRC- 1339 baiting program to reduce sprouting rice damage caused by spring roosting blackbirds. National Wildlife Research Control Report 448. 25pp.

Glahn, J. F., T. Tomsa, and K. J. Preusser. 1999. Impact of great blue heron predation at trout-rearing facilities in the northeast United States. N. Am. J. Aquaculture. 61:349–354.

Glahn, J. F., G. Ellis, P. Fiornelli, and B. Dorr. 2000. Evaluation of low to moderate power lasers for dispersing double-crested cormorants from their night roosts. Proc. 9th Wildl. Damage Manage. Conf. 9:34-35.

Graczyk, T. K., M. R. Cranfield, R. Fayer, J. Tout, and J. J. Goodale. 1997. Infectivity of *Cryptosporidium parvum* through a oocysts is retained upon intestinal passage migratory waterfowl species (Canada goose, *Branta canadnsis*). Tropical Med. International Heal. 2:341-347.

Graczyk, T. K., R. Fayer, J. M. Trout, E. J. Lewis, C. A. Farley, I. Sulaiman, and A. A. Lal. 1998. *Giardia* sp. cysts and infectious *Cryptosporidium parvum* oocysts in the feces of migratory Canada geese (*Branta canadensis*). Applied and Environmental Microbiology. 64:2736-2738.

Graves, G. E., and W. F. Andelt. 1987. Prevention and control of woodpecker damage. Service in Action, Colo. St. Univ. Coop. Ex. Serv. Publ. no 6.516. Ft. Collins, Colo. 2 pp.

Gubler, D. J. 2006. Human arbovirus infections worldwide. Annals New York Academy of Sciences. 951(1) : 13-24.

Hatch J.J. and D.V. Weseloh. 1999. Double-crested cormorant: (Phalacrocorax auritus). In The Birds of North America, No. 441 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

Hatch, J. J. 1995. Changing populations of double-crested cormorants. Colonial Waterbirds 18 (Spec. Publ. 1): 8–24.

Henny, C. J. 1990. Mortality. Pp 140 - 151 *in* Birds of Prey. I. Newton, P. Olsen, and T. Pyrzalowski, eds. Facts on File, NY, NY. 240 pp.

Heusmann, H. W., and R. Bellville. 1978. Effects of nest removal on starling populations. Wilson Bull. 90:287-290.

Heusmann, H. W. and J. R. Sauer. 1997. A survey for mallard pairs in the Atlantic Flyway. J. Wildl. Manage. 61:1191–1198.

Heusmann, H. W. and J. R. Sauer. 2000. The northeast states' breeding waterfowl population survey. Wildl. Soc. Bull. 28:355–364.

Hill, G. A., and D. J. Grimes. 1984. Seasonal study of freshwater lake and migratory waterfowl for *Campylobacter jejuni*. Can. J. Micro. 30:845-849.

Holler, N. R., and E. W. Schafer, Jr. 1982. Potential secondary hazards of Avitrol baits to sharp-shinned hawks and American kestrels. J. Wildl. Manage. 46:457-462.

Jackson, Bette J. and J. A. Jackson. 2000. Killdeer (Charadrius vociferus), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/517doi:10.2173/bna.517

Johnson, R. J. 1994. American Crows *in* S. E. Hyngstrom, R. M. Timm, and G. E. Larson, editors. Prevention and control of wildlife damage. Univ. Of Nebraska, Lincoln, NE. pp 33-40.

Johnson, R. J., and J. F. Glahn. 1994. European Starlings *in* S. E. Hygnstrom, R.M. Timm, and G.E. Larson, editors. Prevention and control of wildlife damage - 1994. Univ. NE Coop. Ext., Instit. of Ag. and Nat. Res., Univ. of NE-Lincoln, USDA, APHIS, Animal Damage Control, Great Plains Ag. Council Wildl. Committee. pp 109 - 120.

Johnston, J. J., D. B. Hurlbut, M. L. Avery, and J. C. Rhyans. 1999. Methods for the diagnosis of acute 3-chloro-p-toluidine hydrochloride poisoning in birds and the estimation of secondary hazards to wildlife. Environ. Toxicology and Chemistry. 18:2533-2537.

Kassa, H., B. Harrington, and M. S. Bisesi. 2001. Risk of occupational exposure to *Cryptosporidium, Giardia,* and *Campylobacter* associated with the feces of giant Canada geese. Appl. Occup. Env. Hygiene. 16:905-909.

Kendall, R. J., T. E. Lacher, Jr., C. Bunck, B. Daniel, C. Driver, C. E. Grue, F. Leighton, W. Stansley, P. G. Watanabe, and M. Whitworth. 1996. An ecological risk assessment of lead shot exposure in non-waterfowl avian species: Upland game birds and raptors. Environ. Toxicol. and Chem. 15:4-20.

Kennamer, M. C. 2010. Eastern wild turkey (*Meleagris gallopavo silvestris*). National Wild Turkey Federation. Bulletin No. 1. Accessed online February 7, 2014: http://www.nwtf.org/conservation/bulletins/bulletin_01.pdf.

Kilham, L. 1989. The American Crow and the Common Raven. Texas A&M Press, College Station, Texas. 255 pp.

Klimstra, J. D. 2014. Migratory Bird Data Center. Mid-winter Waterfowl Survey Data Results. Accessed online October 23, 2014: https://migbirdapps.fws.gov/mbdc/databases/mwi/mwidb.asp?opt=mwidb.

Klimstra, J. D., and P. I. Padding. 2012. Atlantic Flyway waterfowl harvest and population survey data, United States Fish and Wildlife Service, Division of Migratory Bird Management, Laurel, Maryland, USA.

Knittle, C. E., and J. L. Guarino. 1976. Reducing a local population of European Starlings with nest-box traps. Proc. Bird Control. Semin. 7:65-66.

Knittle, C. E., E. W. Schafer, Jr., and K. A. Fagerstone. 1990. Status of compound DRC-1339 registration. Vertebr. Pest Conf. 14:311-313.

Knutsen, G. A. 1998. Avian use of rice-baited and unbaited stubble fields during spring migration in South Dakota. M.S. Thesis, North Dakota State University, Fargo, North Dakota. 160 pp.

Korfanty, C., W.G. Miyasaki, and J.L. Harcus. 1999. Review of the population status and management of double-crested cormorants in Ontario. Pg 131-145 *in* (M.E. Tobin, Tech. Coord.) Symposium on double-crested cormorants: Population status and management issues in the Midwest. 9 December 1997., Milwaukee, WI. Tech. Bull. 1879. Washington, D.C.: U.S. Department of Agriculture, Animal and Plant Health Inspection Service.

Kreps, L. B. 1974. Feral pigeon control. Proc. Vertebr. Pest. Conf. 6:257-262.

Laidlaw, M. A., H. W. Mielke, G. M. Filippelli, D. L. Johnson, and C. R. Gonzales. 2005. Seasonality and children's blood lead levels: Developing a predictive model using climatic variables and blood lead data from Indianapolis, Indiana, Syracuse, New York, and New Orleans, Louisiana (USA). Environ. Health Persp. 113:793-800.

Lemmon, C.R., G. Burgbee, and G.R. Stephens. 1994. Tree damage by nesting double-crested cormorants in Connecticut. Connecticut Warbler 14:27-30.

Lewis, H.F. 1929. The natural history of the double-crested cormorant (*Phalacrocorax auritus*). Ru-Mi-Lou Books, Ottawa, Ontario.

Link, W. A., and Sauer, J. R. 1998. Estimating population change from count data: application to the North American Breeding Bird Survey. Ecological Applications. 8:258-268.

Link, W. A., and J. R. Sauer. 2002. A hierarchical model of population change with application to Cerulean Warblers. Ecology. 83:2832–2840.

Linnell, M. A., M. R. Conover, and T. J. Ohashi. 1996. Analysis of bird strikes at a tropical airport. J. Wildl. Manage. 60:935-945.

Linnell, M. A., M. R. Conover, and T. J. Ohashi. 1999. Biases in bird strike statistics based on pilot reports. J. Wildl. Manage. 63:997-1003.

Linz, G. M., D. L. Bergman, H. J. Homan, and W. J. Bleier. 1999. Effects of herbicide induced habitat alterations on blackbird damage to sunflower. Crop Protection. 14:625–629.

Linz, G. M., D. A. Schaaf, R. L. Wimberly, H. J. Homan, T. L. Pugh, B. D. Peer, P. Mastrangelo, and W. J. Bleier. 2000. Efficacy and potential nontarget impacts of DRC-1339 avicide use in ripening sunflower fields: 1999 progress report. Pp. 162-169 *in* L. Kroh, ed.Proceedings of the 22nd Sunflower Research Workshop. (January 18-19, 2000, Fargo, North Dakota). National Sunflower Association, Bismarck, North Dakota.

Lipnick, R., J. A. Cotrouvo, R. N. Hill, R. D. Bruce, D. A. Stitzel, A. P. Walker, I. Chu, M. Goddard, L. Segal, J. A. Springer, and R. C. Meyers. 1995. Comparison of the Up-and-Down, conventional LD_{50}, and Fixed-Dose Acute Toxicity procedure. Food Chemistry and Toxicology. 33:223-331.

Longcore, J. R., D. G. Mcauley, G. R. Hepp, and J. M. Rhymer. 2000. American black duck (*Anas rubripes*) *in* A. Poole and F. Gill, editors. The Birds of North America Online. Cornell Lab of Ornithology, Ithaca, New York, USA. Accessed online January 14, 2013: http://bna.birds.cornell.edu/bna/species/481/articles/introduction.

Lowther, P. E., and C. L. Cink. 2006. House sparrow (*Passer domesticus*) in A. Poole and F. Gill, editors. The Birds of North America Online. Cornell Lab of Ornithology, Ithaca, New York, USA. Accessed online January 7, 2014: http://bna.birds.cornell.edu/bna/species/012.

Luechtefeld, N. W., M. J. Blaser, L. B. Reller, and W. L. L. Wang. 1980. Isolation of *Campylobacter fetus* subsp. *Jejuni* from migratory waterfowl. J. Clin. Microbiol. 12:406-408.

MacKinnon, B., R. Sowden, and S. Dudley, editors. 2001. Sharing the skies: an aviation guide to the management of wildlife hazards. Transport Canada, Aviation Publishing, Ottawa, Ontario, Canada.

Mancl, K. M. 1989. Bacteria in drinking water: Bulletin 795. The Ohio State University Cooperative Extension Service, Columbus, Ohio, USA.

MANEM Waterbird Working Group. 2006. Waterbird Conservation Plan for the Mid-Atlantic/New England/Maritimes Region: 2006-2010. Waterbird Conservation for the Americas (www.waterbirdconservation.org)

MANEM (Mid-Atlantic, New England, Maritimes Regional Waterbird Plan). 2006. http://www.fws.gov/birds/waterbirds/manem/index.html

Mason, J. R., and L. Clark. 1992. Non-lethal repellents: the development of cost-effective, practical solutions to agricultural and industrial problems. Proc. Vertebr. Pest Conf. 15:115-129.

Mason, J. R., A. H. Arzt, and R. F. Reidinger. 1984. Evaluation of dimethylanthranilate as a nontoxic starling repellent for feedlot settings. Proc. East. Wildl. Damage Control Conf. 1:259-263.

Mason, J. R., M. A. Adams, and L. Clark. 1989. Anthranilate repellency to European starlings: chemical correlates and sensory perception. Journal of Wildlife Management 53:55-64.

Matteson, R. E. 1978. Acute oral toxicity of DRC-1339 to cardinals (*Cardinalis cardinalis*). U.S. Fish and Wildlife Service, Denver Wildlife Research Center, Bird Damage Research Report 84. 3 pp.

McCracken, H. F. 1972. Starling control in Sonoma County. Proc. Vertebr. Pest Conf. 5:124-126.

McGowan, K. J. 2001. Fish Crow (*Corvus ossifragus*) *in* The Birds of North America, No. 589 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA

Mitterling, L. A. 1965. Bird damage on apples. Proc. Am. Soc. Horticultural Science. 87:66–72.

Morris R.D., Blokpoel H. & Tessier G.D. 1992. Management efforts for the conservation of common tern *Sterna hirundo* colonies in the Great Lakes: two case histories. *Biological Conservation*, 60, 7-14

Morris, R. D., D. V. Weseloh, L. R. Wires. C. Pekank, F. J. Cuthbert. 2011. Population trends of ring-billed gulls breeding on the North American Great Lakes. Waterbirds, 34 (2) 202-212.

Mott, D. F. 1985. Dispersing blackbird-starling roosts with helium-filled balloons. Proc. East. Wildl. Damage Conf. 2:156-162.

Mott, D. F., and C. P. Stone. 1973. Bird damage to blueberries in the United States. U.S. Bur. Sport Fisheries and Wildlife, Spec. Sci. Rept., Wildl. No. 172. 15 pp.

Mowbray, T. B., F. Cooke and B. Ganter. 2000. Snow Goose (Chen caerulescens), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology. Accessed online January 7, 2014: http://bna.birds.cornell.edu/bna/species/514doi:10.2173/bna.514.

NAS. 2010. The Christmas Bird Count Historical Results. Accessed online September 25, 2014: www.christmasbirdcount.org.

NASS. 2012. Vermont Farm Statistics at a Glance. U.S. Department of Agriculutre, National Agricultural Statistics Service. Accessed online April 3, 2014: http://www.nass.usda.gov/Statistics_by_State/Vermont/index.asp

NASS. 2014. 2012 Census of Agriculture. U.S. Department of Agriculture, National Agricultural Statistics Service. Accessed online April 3, 2014: http://www.agcensus.usda.gov/Publications/2012/Full_Report/Census_by_State/Vermont

National Audubon Society. 2010. The Christmas Bird Count Historical Results [Online]. Available http://www.christmasbirdcount.org [March, 12 2012]

National Audubon Society. 2002. National Audubon Society. The Christmas Bird Count Historical Results. www.audubon.org/bird/cbc. Accessed on July, 2009.

National Wild Turkey Federation. 2014. All about wild turkeys. Accessed online September 15, 2014: http://www.nwtf.org/for_hunters/all_about_turkeys.html.

Pacha, R. E., G. W. Clark, E. A. Williams, and A. M. Carter. 1988. Migratory birds of central Washington as reservoirs of *Campylobacter jejuni.* Can. J. Micro. 34:80-82.

Parkhurst, J.A., R.P. Brooks, and D.E. Arnold. 1987. A survey of wildlife depredation and control techniques at fish-rearing facilities. Wildl. Soc. Bull. 15:386-394.

Parkhurst, J.A., R.P. Brooks, and D.E. Arnold. 1992. Assessment of predation at trout hatcheries in central Pennsylvania. Wildl. Soc. Bull. 20:411-419.

Parmelee, David F. 1992. Snowy Owl (*Bubo scandiacus*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/010.

PFSC - Partners in Flight Science Committee. 2013. Population Estimates Database, version 2013. Accessed online September 25, 2014: http://rmbo.org/pifpopestimates.

Peoples, S. A., and A. Apostolou. 1967. A comparison between the metabolism of DRC-1339 in rabbits and in starlings. Progress report on starling control. University of California, Davis.

Pimentel, D., L. Lech, R. Zuniga, and D. Morrison. 2000. Environmental and economic costs associated with nonindigenous species in the United States. BioScience. 50:53–65.

Pochop, P. A. 1998. Comparison of white mineral oil and corn oil to reduce hatchability of ring-billed gull eggs. Proc. Vertebr. Pest Conf. 18:411-413.

Pochop, P. A., J. L. Cummings, J. E. Steuber, and C. A. Yoder. 1998. Effectiveness of several oils to reduce hatchability of chicken eggs. J. Wildl. Manage. 62:395-398.

Poole, A.F., R.O. Bierregaard, and M.S. Martell. 2002. Osprey (*Pandion haliaetus*) *in* The Birds of North America, No. 683 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

Rabenhold, P. P., and M. D. Decker. 1989. Black and turkey vultures expand their ranges northward. The Eyas. 12:11-15.

Raftovich, R. V., S. Chandler and K. A. Wilkins. 2014. Migratory bird hunting activity and harvest during the 2012-13 and 2013-14 hunting seasons. U.S. Fish and Wildlife Service, Laurel, Maryland, USA.

Rich, T. D., C. J. Beardmore, H. Berlanga, P. J. Blancher, M. S. W. Bradstreet, G. S. Butcher, D. W. Demarest, E. H. Dunn, W. C. Hunter, E. E. Iñigo-Elias, J. A. Kennedy, A. M. Martell, A. O. Panjabi, D. N. Pashley, K. V. Rosenberg, C. M. Rustay, J. S. Wendt, and T. C. Will. 2004. Partners in Flight North American Landbird Conservation Plan. Cornell Lab of Ornithology. Ithaca, New York.

Robinson, M. 1996. The potential for significant financial loss resulting from bird strikes in or around an airport. Proc. Bird Strike Committee Europe. 22:353-367.

Roffe, T. J. 1987. Avian tuberculosis. Pp. 95-99 *in* M. Friend and C. J. Laitman, eds. Field Guide to Wildlife Diseases. 225 pp.

Rogers, J. G., Jr., and J. T. Linehan. 1977. Some aspects of grackle feeding behavior in newly planted corn. J. Wildl. Manage. 41:444-447.

Rossbach, R. 1975. Further experiences with the electroacoustic method of driving European Starlings from their sleeping areas. Emberiza. 2:176-179.

Royall, W. C., T. J. DeCino, and J. F. Besser. 1967. Reduction of a Starling Population at a Turkey Farm. Poultry Science. Vol. XLVI No. 6. Pp. 1494-1495.

Saltoun, C. A., K. E. Harris, T. L. Mathisen, and R. Patterson. 2000. Hypersensitivity pneumonitis resulting from community exposure to Canada goose droppings: when an external environmental antigen becomes an indoor environmental antigen. Annal. Allergy Asth. Immun. 84:84-86.

Sauer, J. R., J. E. Hines, J. E. Fallon, K. L. Pardieck, D. J. Ziolkowski, Jr., and W. A. Link. 2014. The North American Breeding Bird Survey, Results and Analysis 1966 - 2011. Version 2.19.2014. USGS Patuxent Wildlife Research Center, Laurel, Maryland.

Sauer, J. R., and W. A. Link. 2011. Analysis of the North American Breeding Bird Survey Using Hierarchical Models. Auk. 128:87–98.

Schafer, E. W., Jr. 1970. *A Summary of the Acute Toxicity,Chronic Toxicity and Secondary Hazards of 4-Aminopyridine DRC-1327) to Birds and Mammals,"* Unpublished Denver Wildlife Research Center report, #10 109, Denver Wildlife Research Center, Denver, Colorado.

Schafer, E. W., Jr. 1972. The acute oral toxicity of 369 pesticidal, pharmaceutical, and other chemicals to wild birds. Toxicol. Appl. Pharmacol. 21:315.

Schafer, E. W., Jr. 1981. Bird control chemicals - nature, modes of action, and toxicity. Pp 129-139 *in* CRC handbook of pest management in agriculture. Vol. 3. CRC Press, Cleveland, OH.

Schafer, E. W., Jr. 1984. Potential primary and secondary hazards of avicides. Proc. Vert. Pest Conf. 11:217-222.

Schafer, E. W., Jr. 1991. Bird control chemicals-nature, mode of action and toxicity. Pp 599-610 *in* CRC Handbook of Pest Management in Agriculture Vol. II. CRC Press, Cleveland, OH.

Schafer, E. W., Jr., and D. J. Cunningham. 1966. Toxicity of DRC-1339 to grackles and house finches. U.S. Fish and Wildl. Serv. Denver Wildlife Research Center, Typed Rept. 1 pp.

Schafer, E. W., Jr., R. B. Brunton, and N. F. Lockyer. 1974. Hazards to animals feeding on blackbirds killed with 4-aminopyrine baits. J. Wildl. Manage. 38:424-426.

Schafer, E. W., Jr., R. B. Brunton, D. J. Cunningham, and N. F. Lockyer. 1977. The chronic toxicity of 3-chloro-4-methyl benzamine HCl to birds. Archives of Environmental Contamination and Toxicology. 6:241-248.

Schmidt, R. H., and R. J. Johnson. 1984. Bird dispersal recordings: an overview. ASTM STP. 817. 4:43-65.

Schmidt, R.H. 1989. Animal welfare and wildlife management. Trans. N.A. Wildl. and Nat. Res. Conf. 54:468-475.

Slate, D. A., R. Owens, G. Connolly, and G. Simmons. 1992. Decision making for wildlife damage management. Trans. N. Am. Wildl. Nat. Res. Conf. 57:51-62.

Smith, J. A. 1999. Nontarget avian use of DRC-1339 treated plots during an experimental blackbird control program in eastern South Dakota. M.S. Thesis, South Dakota State University, Brookings, South Dakota.

Sobeck, E. 2010. Department of the Interior, Fish and Wildlife Service, 50 CFR Part 21, Migratory Bird Permits: Removal of rusty blackbird and Tamaulipas (Mexican) crows from the depredation order for blackbirds, cowbirds, grackles, crows, and magpies, and other changes to the order, final rule. Federal Register 75 (231, Thursday, December 2, 2010): 75153-75156.

Stansley W., L. Widjeskog, and D. E. Roscoe. 1992. Lead contamination and mobility in surface water at trap and skeet ranges. Bulletin of Environmental Contamination and Toxicology. 49:640–647.

Sterner, R. T., D. J. Elias, and D. R. Cerven. 1992. The pesticide reregistration process: collection of human health hazards data for 3-chloro-p-toluidine hydrochloride (DRC-1339). Pp. 62-66 *in* J. E. Borrecco and R. E. Marsh, eds., Proceedings 15th Vertebrate Pest Conference, March 3-5, 1992, Newport Beach, California.

Sterritt, R. M., and J. N. Lester. 1988. Microbiology for environmental and public health engineers. E. & F. N. Spon, Ltd., New York.

The Cornell Lab of Ornithology. 2014. All About Birds. http://www.allaboutbirds.org/guide/search. Accessed November 18, 2014.

The Wildlife Society. 2010. Final Position Statement: Wildlife Damage Management. The Wildlife Society. Bethesda, MD. 2 pp.

Thorpe, J. 1996. Fatalities and destroyed civil aircraft due to bird strikes: 1912-1995. Proc. Int. Bird Strike Conf. 23:17-31.

Tobin, M. E., P. P. Woronecki, R. A. Dolbeer, and R. L. Bruggers. 1988. Reflecting tape fails to protect ripening blueberries from bird damage. Wildl. Soc. Bull. 16:300-303.

Twedt, D. J., and J. F. Glahn. 1982. Reducing starling depredations at livestock feeding operations through changes in management practices. Proc. Vertebr. Pest Conf. 10:159-163.

Tyson, L. A., J. L. Belant, F. J. Cuthbert, and D. V. Weseloh. 1999. Nesting populations of double-crested cormorants in the United States and Canada. Pp. 17-25. Symposium on Double-crested Cormorants: Population Status and Management Issues in the Midwest, December 9, 1997, M. E. Tobin, ed. USDA Technical Bulletin No. 1879. 164 pp.

USDA. 2001. Compound DRC-1339 Concentrate-Staging Areas. Tech Note. USDA/APHIS/WS. National Wildlife Research Center, Fort Collins, Colorado.

USDA. 2004 Environmental Assessment: Reducing bird damage through an Integrated Damage Management Program in Vermont. United States Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Services. Concord, New Hampshire.

USDA. 2005. An Early Detection System for Asian H5N1 Highly Pathogenic Avian Influenza in Wild Migratory Birds. United States Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Services, Operational Support Staff, Riverdale, Maryland, USA. 87 pp.

USDA. 2007 Supplement to the Environmental Assessment: Reducing bird damage through an Integrated Damage Management Program in Vermont. United States Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Services. Concord, New Hampshire.

USDA. 2010 Supplement to the Environmental Assessment: Reducing bird damage through an Integrated Damage Management Program in Vermont. United States Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Services. Concord, New Hampshire.

USFWS. 2001. Inside Region 3: Ohio man to pay more than $11,000 for poisoning migratory birds. Volume 4(2):5.

USFWS. 2003. Final Environmental Impact Statement: Double-crested cormorant management. U.S. Dept. of the Interior, U.S. Fish and Wildlife Service, Div. of Migratory Bird Management, 4401 N. Fairfax Drive MS 634, Arlington, VA 22203.

USFWS. 2003b. Final Environmental Impact Statement: Double-crested Cormorant Management. U.S. Dept. of the Interior, USFWS, Div. of Migratory Bird Management, 4401 N. Fairfax Drive MS 634, Arlington, VA 22203.

USFWS. 2005. Final Environmental Impact Statement: Resident Canada goose management. U.S. Fish and Wildlife Service, Div. of Migratory Bird Management. Arlington, Virginia. Accessed online January 29, 2014: http://www.fws.gov/migratorybirds/issues/cangeese/finaleis.htm.

USFWS. 2007. Final Environmental Impact Statement: Light goose management. U.S. Fish and Wildlife Service. Accessed online January 29, 2014: http://www.fws.gov/migratorybirds/CurrentBirdIssues/Management/snowgse/FinalEIS2007/Light%20goose%20EIS.pdf.

USFWS. 2009. Environmental Assessment: Extended management of double-crested cormorants under 50 CFR 21.47 and 21.48. U.S. Fish and Wildlife Service, Div. of Migratory Bird Management, 4401 N. Fairfax Drive, Mail Stop 4107, Arlington, VA 22203.

USFWS. 2012. Final Environmental Assessment: proposal to permit take as provided under the Bald and Golden Eagle Protection Act. U.S. Fish and Wildlife Service, Div. of Migratory Bird Management. Arlington, Virginia.

USFWS. 2014. Mallard Population Estimate. Accessed online October 23, 2014: http://www.flyways.us/status-of-waterfowl/population-estimates/2014-mallard-population-estimates.

USGS. 2005. Ospreys in Oregon and the Pacific Northwest. United States Geological Survey. http://fresc.usgs.gov/products/fs/fs-153-02.pdf. Accessed September 28, 2009.

Verbeek, N. A. and C. Caffrey. 2002. American Crow (*Corvus brachyrhynchos), in* The Birds of North America, No. 647 (A. Poole, Ed.). The Birds of North American Online, Ithaca, New York.

VerCauteren, K. C., and D. R. Marks. 2004. Movements of urban Canada geese: implications for nicarbazin treatment programs. Pp. 151-156 *in* T. J. Moser, R. D. Lien, K. C. VerCauteren, K. F. Abraham, D. E. Anderson, J. G. Bruggink, J. M. Coluccy, D. A. Graber, J. O. Leafloor, D. R. Luukkonen, and R. E. Trost, editors. Proc. 2003 International Canada Goose Symposium. Madison, Wisconsin.

VAAFM. VT Agency of Agriculture, Food and Markets. Information obtained at website, March 2015.

VFWD (Vermont Fish and Wildlife Department). 2015 Vermont Department of Fish and Wildlife Reports. Information obtained at website: http://www.vtfishandwildlife.com.

VOGA. VT Outdoor Guide Association. Information obtained at website, March 2015.

Vogt, P. F. 1997. Control of nuisance birds by fogging with REJEX-IT TP-40. Proc. Great Plains Wildl. Damage Contr. Workshop. 13: 63-66.

Weber, W.J. 1979. Health Hazards from Pigeons, European Starlings, and English Sparrows. Thompson Publ. Fresno, Calif. 138 pp.

Weeks, R. J., and Stickley, A. R. 1984. Histoplasmosis and its relation to bird roosts: a review. Denver Wildl. Res. Ctr. Bird Damage Rpt. No. 330. U.S. Fish and Wildl. Serv. 23pp.

Weseloh, D.V. and B. Collier. 1995. The rise of the double-crested cormorant on the Great Lakes: winning the war against contaminants. Great Lakes Fact sheet. Canadian Wildlife Service, Environment Canada and Long Point Observatory.

Weseloh, D.V., and P.J. Ewins. 1994. Characteristics of a rapidly increasing colony of double-crested cormorants (*Phalacrocorax auritus*) in Lake Ontario: population size, reproductive parameters and band recoveries. J. Great Lakes Res. 20(2):443-456.

Weseloh, D. V., P. J. Ewins, J. Struger, P. Mineau, C. A. Bishop, et al. 1995. Double-crested Cormorants of the Great Lakes: Changes in population size, breeding distribution and reproductive output between 1913 and 1991. Colon. Waterbirds 18 (Spec. Publ.1):48-59.

West, R.R., J.F. Besser and J.W. DeGrazio. 1967. Starling control in livestock feeding areas. Proc. Vertebr. Pest Conf. San Francisco, CA.

West, R. R., and J. F. Besser. 1976. Selection of toxic poultry pellets from cattle rations by European Starlings. Proc. Bird Control Semin. 7:242-244.

White, D. H., L. E. Hayes, and P. B. Bush. 1989. Case histories of wild birds killed intentionally with famphur in Georgia and Vermont. J. Wildl. Dis. 25:144-188.

Wilbur, S. R. 1983. The status of vultures in the western hemisphere. Pp. 113-123. *in* Vulture biology and management. Eds. By S.R. Wilbur and J.A. Jackson. University of California Press. Berkeley.

Williams, R. E. 1983. Integrated management of wintering blackbirds and their economic impact at south Texas feedlots. Ph.D. Dissertation, Tex. A&M Univ., College Station. 282 pp.

Williams, D. E., and R. M. Corrigan. 1994. Pigeons (Rock Doves). Pp E-87 to E-96 *in* S. E. Hygnstrom, R. M. Timm and G. E. Larson (eds.) Prevention and Control of Wildlife Damage. Univ. Nebraska and USDA-APHIS-WS and Great Plains Agric. Council Wildl. Comm., Lincoln, Nebraska.

Winkler, David W., Kelly K. Hallinger, Daniel R. Ardia, R. J. Robertson, B. J. Stutchbury and R. R. Cohen. 2011. Tree Swallow (Tachycineta bicolor), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/011doi:10.2173/bna.11

Wires, L. R., F. J. Cuthbert, D. R. Trexel, and A. R. Joshi. 2001. Status of the double-crested cormorant (*Phalacrocorax auritus*) in North America. Report to the U.S. Fish and Wildlife Service, Arlington, Virginia, USA.

Wobeser, G., and C. J. Brand. 1982. Chlamydiosis in 2 biologists investigating disease occurrences in wild waterfowl. Wildl. Soc. Bull. 10170-172.

Woronecki, P. P., R. A. Dolbeer, and T. W. Seamans. 1990. Use of alpha-chloralose to remove waterfowl from nuisance and damage situations. Proc. Vertbr. Pest Conf. 14:343-349.

Wright, E. N. 1973. Experiments to control starling damage at intensive animal husbandry units. Bull. OEPP. 9:85-89.

Wright, S. E., and R. A. Dolbeer. 2005. Percentage of wildlife strikes reported and species identified under a voluntary system *in* Proceedings of Bird Strike Committee USA/Canada meeting, Vancouver, B.C., Canada.

Yeates, J. 2010. Death is a welfare issue. J Agric Environ Ethics 2010; 23:229-241.

APPENDIX B

BIRD DAMAGE MANAGEMENT METHODS AVAILABLE FOR USE

NON-LETHAL METHODS - NONCHEMICAL

Agricultural producer and property owner practices. These consist primarily of non-lethal preventive methods such as cultural methods and habitat modification. Cultural methods and other management techniques are implemented by the agricultural producer or property owners/managers. Resource owners/managers may be encouraged to use these methods, based on the level of risk, need, and professional judgment on their effectiveness and practicality. These methods include:

Cultural methods. These may include altering planting dates so that crops are not young and more vulnerable to damage when the damage-causing species is present, or the planting of crops that are less attractive or less vulnerable to such species. At feedlots or dairies, cultural methods generally involve modifications to the level of care or attention given to livestock which may vary depending on the age and size of the livestock. Animal husbandry practices include, but are not limited to, techniques such as night feeding, indoor feeding, closed barns or corrals, removal of spilled grain or standing water, and use of bird proof feeders (Johnson and Glahn 1994).

Environmental/Habitat modification can be an integral part of bird damage management. Wildlife production and/or presence are directly related to the type, quality, and quantity of suitable habitat. Therefore, habitat can be managed to reduce or eliminate the production or attraction of certain bird species or to repel certain birds. In most cases, the resource or property owner is responsible for implementing habitat modifications, and WS only provides advice on the type of modifications that have the best chance of achieving the desired effect. Habitat management is most often a primary component of bird damage management strategies at or near airports to reduce bird aircraft strike problems by eliminating bird nesting, roosting, loafing, or feeding sites. Generally, many bird problems on airport properties can be minimized through management of vegetation and water from areas adjacent to aircraft runways. Habitat management is often necessary to minimize damage caused by crows and blackbirds that form large roosts during late autumn and winter. Bird activity can be greatly reduced at roost sites by removing all the trees or selectively thinning the stand.

Animal behavior modification. This refers to tactics that alter the behavior of wildlife to reduce damage. Animal behavior modification may involve use of scare tactics or fencing to deter or repel animals that cause loss or damage (Twedt and Glahn 1982). Some but not all methods that are included by this category are bird-proof barriers, electronic guards, propane exploders, pyrotechnics, distress calls and sound producing devices, chemical frightening agents, repellents, scarecrows, mylar tape, lasers, and eye-spot balloons.

These techniques are generally only practical for small areas. Scaring devices such as distress calls, helium-filled eyespot balloons, raptor effigies and silhouettes, mirrors, and moving disks can be effective, but usually for only a short time before birds become accustomed and learn to ignore them (Arhart 1972, Rossbach 1975, Conover 1982, Schmidt and Johnson 1984, Mott 1985, Graves and Andelt 1987, Bomford 1990). Mylar tape has produced mixed results in its effectiveness to frighten birds (Dolbeer et al. 1986, Tobin et al. 1988).

Paintball guns are used as a non-lethal harassment method to disperse birds from areas using physical harassment. Paintballs are most often used to harass waterfowl. Paintballs can be used to produce physically and visually negative-reinforcing stimuli that can aid in the dispersement of birds from areas where damages or threats of damages are occurring.

Bird proof barriers can be effective, but are often cost-prohibitive, particularly because of the aerial mobility of birds which requires overhead barriers as well as peripheral fencing or netting. Exclusion adequate to stop bird movements can also restrict movements of livestock, people and other wildlife (Fuller-Perrine and Tobin 1993).

Overhead wire grids can deter crow use of specific areas where they are causing a nuisance (Johnson 1994). The birds apparently fear colliding with the wires and thus avoid flying into areas where the method has been employed. Netting can be used to exclude birds from a specific area by the placement of bird proof netting over and around the specific resource to be protected. Exclusion may be impractical in most settings (e.g., commercial agriculture), however it can be practical in small areas (e.g., personal gardens) or for high-value crops (e.g., grapes) (Johnson 1994). Although this alternative would provide short-term relief from damage, it may not completely deter birds from feeding, loafing, staging, or roosting at that site. A few people would find exclusionary devices such as netting unsightly, trashy, and cause a decreased aesthetic value of the neighborhood when used over personal gardens.

Auditory scaring devices such as propane exploders, pyrotechnics, electronic guards, scare crows, and audio distress/predator vocalizations are effective in many situations for dispersing damage-causing bird species. These devices are sometimes effective, but usually only for a short period of time before birds become accustomed and learn to ignore them (Arhart 1972, Rossbach 1975, Schmidt and Johnson 1984, Mott 1985, Bomford 1990). Williams (1983) reported an approximate 50% reduction in blackbirds at two south Texas feedlots as a result of pyrotechnics and propane cannon use. However, they are often not practical in dairy or feedlot situations because of the disturbance to livestock, although livestock can generally be expected to habituate to the noise. Birds, too, quickly learn to ignore scaring devices if the birds' fear of the methods is not reinforced with shooting or other tactics.

Visual scaring techniques such as use of Mylar tape (highly reflective surface produces flashes of light that startles birds), eye-spot balloons (the large eyes supposedly give birds a visual cue that a large predator is present), flags, effigies (scarecrows), sometimes are effective in reducing bird damage. Mylar tape has produced mixed results in its effectiveness to frighten birds (Dolbeer et al. 1986, and Tobin et al. 1988). Birds quickly learn to ignore visual and other scaring devices if the birds' fear of the methods is not reinforced with shooting or other tactics.

Lasers are a non-lethal technique recently evaluated by the NWRC (Glahn et al. 2000, Blackwell et al. 2002). For best results and to disperse numerous birds from a roost, the laser is most effectively used in periods of low light, such as after sunset and before sunrise. In the daytime, the laser can also be used during overcast conditions or in shaded areas to move individual and small numbers of birds, although the effective range of the laser is much diminished. Blackwell et al. (2002) tested lasers on several bird species and observed varied results among species. Lasers were ineffective at dispersing mallards with birds habituating in approximately 5 minutes and 20 minutes, respectively (Blackwell et al. 2002). As with other bird damage management tools lasers are most effective when used as part of an integrated management program.

Live traps (although live traps are non-lethal, birds may be euthanized upon capture). In most situations, live trapped birds are subsequently euthanized. Relocation to other areas following live capture would not generally be effective because problem bird species are highly mobile and can easily return to damage sites from long distances; habitats in other areas are generally already occupied; and relocation would most likely result in bird damage problems at the new location. Translocation of wildlife is also discouraged by WS' policy (WS Directive 2.501) because of stress to the relocated animal, poor survival rates, and difficulties in adapting to new locations or habitats. Live traps include:

Decoy traps are used by WS for preventive and corrective damage management. Decoy traps are similar in design to the Australian Crow Trap as reported by McCracken (1972) and Johnson and Glahn (1994). Live decoy birds of the same species that are being targeted are usually placed in the trap with sufficient food and water to assure their survival. Perches are configured in the trap to allow birds to roost above the ground and in a more natural position. Feeding behavior and calls of the decoy birds attract other birds which enter and become trapped themselves. Active decoy traps are monitored daily to remove and euthanize excess birds and to replenish bait and water. Decoy traps and other cage/live traps, as applied and used by WS, pose no danger to pets or the public and if a pet is accidentally captured in such traps, it can be released unharmed.

Nest box traps may be used by WS for corrective damage management and are effective in capturing cavity nesting birds (DeHaven and Guarino 1969, Knittle and Guarino 1976).

Mist nets are more commonly used for capturing small-sized birds, but can be used to capture larger birds such as ducks and ring-neck pheasants or even smaller nuisance hawks and owls. It was introduced into the United States in the 1950s from Asia and the Mediterranean where it was used to capture birds for the market (Day et al. 1980). The mist net is a fine black silk or nylon net usually 3 to 10 feet wide and 25 to 35 feet long. Net mesh size determines which birds can be caught and overlapping pockets in the net cause birds to entangle themselves when they fly into the net.

Bow nets could be used to live-capture small, medium and large birds, including but not limited to starlings, shorebirds, ducks, geese, hawks, owls and turkeys. The trap consists of two semicircular bows of light metal with gill netting strung loosely between them. Hinges and springs connect the two semicircles at their bases, the lower one of which is fixed to the ground. When setting the trap, the upper bow is pulled over the lower stationary bow and latched into position. Bait or a lure animal, usually a bird, may be placed in the center of radius of the trap. The trap is triggered, either by a person in a blind pulling a trigger line or by radio-controlled remote.

Cannon nets/Rocket Nets are normally used for larger birds and use mortar projectiles to propel a net up and over birds which have been baited to a particular site.

Raptor traps are varied in form and function and includes but is not limited to Bal-chatri, Dho Gaza traps, Phai hoop traps, and Swedish goshawk traps. These traps could be used specifically to live-trap raptors.

Padded-jaw pole traps are modified No. 0 or 1 coil spring foothold traps used to capture specific target birds such as raptors and crows. These are placed on top of poles or typical roosting spots frequented by targeted birds. These traps are monitored frequently so non-target species can be released unharmed.

Corral traps could be used to live-capture birds, primarily geese and other waterfowl. Corral traps can be effectively used to live capture Canada geese during the annual molt when birds are unable to fly. Each year for a few weeks in the summer, geese are flightless as they are growing new flight feathers. Therefore, geese can be slowly guided into corral-traps.

Funnel traps could be used to live-capture waterfowl. Traps are set up in shallow water and baited. Funnel traps allow waterfowl to enter the trap but prevents the ducks from exiting. Traps would be checked regularly to address live-captured waterfowl. Captured ducks can be relocated or euthanized.

Nest/egg destruction is the removal of nesting materials during the construction phase of the nesting cycle. Nest destruction is generally only applied when dealing with a single bird or very few birds. This method is used to discourage birds from constructing nests in areas, which may create nuisances or safety

issues for home and business owners. Removal of nests is intended to deter birds from nesting in the same area again. Birds generally attempt to re-nest, so the method may need to be conducted repeatedly throughout the nesting season, and over several years. Heusmann and Bellville (1978) reported that nest removal was an effective, but time-consuming, method because problem bird species are highly mobile and can easily return to damage sites from long distances, or because of high populations. This method poses no imminent danger to pets or the public.

Egg Treatment (addling/shaking, puncturing, or oiling) is a method of suppressing reproduction in local nuisance bird populations by destroying egg embryos to arrest their development and eliminate hatching. Treated eggs are returned to the nest and the adult bird remains attached to the nest site. Treatment of eggs is typically done where the current number of birds is tolerable, but additional birds would not be. Treatment of eggs will not reduce the overall problem bird population, but may slow its growth and make adult birds more responsive to harassment (also see *Egg oiling* below).

Lure crops/alternate foods. When damage cannot be avoided by careful crop selection or modified planting schedules, lure crops can sometimes be used to mitigate the loss potential. Lure crops are planted or left for consumption by wildlife as an alternative food source. This approach provides relief for critical crops by sacrificing less important or specifically planted fields. Establishing lure crops is sometimes expensive, requires considerable time and planning to implement, and may attract other unwanted species to the area.

NON-LETHAL METHODS - CHEMICAL

Avitrol is a chemical frightening agent (repellent) that is effective in a single dose when mixed with untreated baits, normally in a 1:9 ratio. Avitrol, however, is not completely non-lethal in that a small portion of the birds are generally killed (Johnson and Glahn 1994). Prebaiting is usually necessary to achieve effective bait acceptance by the target species. This chemical is registered for use on pigeons, crows, blackbirds, starlings, and house sparrows in various situations. Avitrol treated bait is placed in an area where the targeted birds are feeding. When a treated particle is consumed, affected birds begin to broadcast distress vocalizations and display abnormal flying behavior, thereby frightening the remaining flock away.

Avitrol is a restricted-use pesticide that can only be sold to certified applicators and is available in several bait formulations where only a small portion of the individual grains carry the chemical. It can be used during anytime of the year, but is used most often during winter and spring. Any granivorous bird associated with the target species could be affected by Avitrol. Avitrol is water soluble, but laboratory studies demonstrated that Avitrol is strongly absorbed onto soil colloids and has moderately low mobility. Biodegradation is expected to be slow in soil and water, with a half-life ranging from three to 22 months. However, Avitrol may form covalent bonds with humic materials, which may serve to reduce its availability for intake by organisms from water, is non-accumulative in tissues and rapidly metabolized by many species (Schafer, Jr. 1991).

Avitrol is acutely toxic to avian and mammalian species, however, blackbirds are more sensitive to the chemical and there is little evidence of chronic toxicity. Laboratory studies with predator and scavenger species have shown minimal potential for secondary poisoning and during field use only magpies and crows appear to have been affected (Schafer, Jr. 1991). However, a laboratory study by Schafer, Jr. et al. (1974) showed that magpies exposed to two to 3.2 times the published LD_{50} in contaminated prey for 20 days were not adversely affected and three American kestrels that were fed contaminated blackbirds for seven to 45 days were not adversely affected. Some hazards may occur to predatory species consuming unabsorbed chemical in the GI tract of affected or dead birds (Schafer, Jr. 1981, Holler and Shafer 1982).

Methyl anthranilate (artificial grape flavoring used in foods and soft drinks for human consumption) could be used or recommended by WS as a bird repellent. Methyl anthranilate (MA) (artificial grape flavoring food additive) has been shown to be a promising repellent for many bird species, including waterfowl (Dolbeer et al. 1993). Cummings et al. (1995) found effectiveness of MA declined significantly after 7 days. Belant et al. (1996) found MA ineffective as a bird grazing repellent, even when applied at triple the recommended label rate. MA is also under investigation as a potential bird taste repellent. MA may become available for use as a livestock feed additive (Mason et al. 1984, Mason et al. 1989). It is registered for applications to turf or to surface water areas used by unwanted birds. The material has been shown to be nontoxic to bees (LD_{50} > 25 micrograms/bee[11]), nontoxic to rats in an inhalation study (LC_{50} > 2.8 mg/L[12]), and of relatively low toxicity to fish and other invertebrates. Methyl anthranilate is naturally occurring in concord grapes and in the blossoms of several species of flowers and is used as a food additive and perfume ingredient (Dolbeer et al. 1992). It has been listed as "*Generally Recognized as Safe*" by the U.S. Food and Drug Administration (Dolbeer et al. 1992).

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

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

MA is also being investigated as a livestock feed additive to reduce or prevent feed consumption by birds. Such chemicals undergo rigorous testing and research to prove safety, effectiveness, and low environmental risks before they would be registered by EPA or the FDA.

Other chemical repellents. A number of other chemicals have shown bird repellent capabilities. Anthraquinone, a naturally occurring chemical found in many plant species and in some invertebrates as a natural predator defense mechanism, has shown effectiveness in protecting rice seed from red-winged blackbirds and boat-tailed grackles (Avery et al. 1997). It has also shown effectiveness as a foraging repellent against Canada goose grazing on turf and as a seed repellent against brown-headed cowbirds (Dolbeer et al. 1998).

Tactile repellents. A number of tactile repellent products are on the market which reportedly deters birds from roosting on certain structural surfaces by presenting a tacky or sticky surface that the birds avoid. However, experimental data in support of this claim are sparse (Mason and Clark 1992). The repellency of tactile products is generally short-lived because of dust, and they sometimes cause aesthetic problems and expensive clean-up costs by running down the sides of buildings in hot weather.

Alpha-chloralose is a central nervous system depressant used as an immobilizing agent to capture and remove pigeons, waterfowl and other birds. It is labor intensive and in some cases, may not be cost effective (Wright 1973). Alpha-chloralose is typically delivered in a well contained bait in small

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

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

quantities with minimal hazards to pets and humans; single bread or corn baits are fed directly to the target birds. WS' personnel are present at the site of application during baiting to retrieve the immobilized birds. Unconsumed baits are removed from the site following each treatment. Alpha-chloralose was eliminated from more detailed analysis based on critical element screening; therefore, environmental fate properties of this compound were not rigorously assessed. However, the solubility and mobility are believed to be moderate and environmental persistence is believed to be low. Bioaccumulation in plants and animal tissue is believed to be low. Alpha-chloralose is used in other countries as an avian and mammalian toxicant. The compound is slowly metabolized, with recovery occurring a few hours after administration (Schafer, Jr. 1991). The dose used for immobilization is designed to be about two to 30 times lower than the LD_{50}. Mammalian data indicate higher LD_{50} values than birds. Toxicity to aquatic organisms is unknown (Woronecki et al. 1990), but the compound is not generally soluble in water and therefore should remain unavailable to aquatic organisms. Factors supporting the determination of this low potential included the lack of exposure to pets, non-target species and the public, and the low toxicity of the active ingredient. Other supporting rationale for this determination included relatively low total annual use and a limited number of potential exposure pathways. The agent is currently approved for use by WS as an Investigative New Animal Drug by the FDA rather than a pesticide.

Egg oiling is a method for suppressing reproduction of nuisance birds by spraying a small quantity of food grade vegetable oil or mineral oil on eggs in nests. The oil prevents exchange of gases and causes asphyxiation of developing embryos and has been found to be 96-100% effective in reducing hatchability (Pochop 1998, Pochop et al. 1998). The method has an advantage over nest or egg destruction in that the incubating birds generally continue incubation and do not re-nest. The EPA has ruled that use of corn oil for this purpose is exempt from registration requirements under FIFRA. To be most effective, the oil should be applied anytime between the fifth day after the laying of the last egg in a nest and at least five days before anticipated hatching. This method is extremely target specific and is less labor intensive than egg addling.

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

LETHAL METHODS - MECHANICAL

Shooting is more effective as a dispersal technique than as a way to reduce bird densities when large numbers of birds are present. Normally shooting is conducted with shotguns, rifles or air rifles. Shooting is a very individual specific method and is normally used to remove a single offending bird. However, at times, a few birds could be shot from a flock to make the remainder of the birds more wary and to help reinforce non-lethal methods. It is selective for target species and may be used in conjunction with the use of spotlights, decoys, and calling. Shooting with shotguns, air rifles, or rim and center fire rifles is sometimes used to manage bird damage problems when lethal methods are determined to be appropriate. The birds are killed as quickly and humanely as possible. All firearm safety precautions are followed by WS when conducting bird damage management activities and all laws and regulations governing the lawful use of firearms are strictly complied with.

Firearm use is very sensitive and a public concern because of safety issues relating to the public and misuse. To ensure safe use and awareness, WS' employees who use firearms to conduct official duties are required to attend an approved firearms safety and use training program within 3 months of their appointment and a refresher course every 2 years afterwards (WS Directive 2.615). WS' employees, who

carry firearms as a condition of employment, are required to sign a form certifying that they meet the criteria as stated in the *Lautenberg Amendment* which prohibits firearm possession by anyone who has been convicted of a misdemeanor crime of domestic violence.

Sport hunting is sometimes recommended by WS as a viable damage management method when the target species can be legally hunted. A valid hunting license and other licenses or permits may be required by the WVDNR and the USFWS for certain species. This method provides sport and food for hunters and requires no cost to the landowner. Sport hunting is occasionally recommended if it can be conducted safely for crow damage management around crops or other resources.

Cervical dislocation is sometimes used to euthanize birds which are captured in live traps. The bird is stretched and the neck is hyper-extended and dorsally twisted to separate the first cervical vertebrae from the skull. The AVMA approves this technique as a humane method of euthanasia and states that cervical dislocation when properly executed is a humane technique for euthanasia of poultry and other small birds (Beaver et al. 2001). Cervical dislocation is a technique that may induce rapid unconsciousness, does not chemically contaminate tissue, and is rapidly accomplished (Beaver et al. 2001).

Snap traps are modified rat snap traps used to remove individual birds, and other cavity using birds. The trap treadle is baited with peanut butter or other food attractants and attached near the damage area caused by the offending bird. These traps pose no imminent danger to pets or the public, and are usually located in positions inaccessible to people and most non-avian animals. They are very selective because they are usually set in the defended territory of the target birds.

LETHAL METHODS - CHEMICAL

All chemicals used by WS are registered as required by the FIFRA (administered by the EPA). WS' personnel that use restricted-use chemical methods are certified as pesticide applicators by the State of Vermont and are required to adhere to all certification requirements set forth in FIFRA and Vermont pesticide control laws and regulations. Chemicals are only used on private, public, or tribal property sites with authorization from the property owner/manager.

CO_2 is sometimes used to euthanize birds which are captured in live traps. Live birds are placed in a container such as a plastic 5-gallon bucket or chamber and sealed shut. CO_2 gas is released into the bucket or chamber and birds quickly die after inhaling the gas. This method is approved as a euthanizing agent by the AVMA (Beaver et al. 2001). CO_2 gas is a byproduct of animal respiration, is common in the atmosphere, and is required by plants for photosynthesis. It is used to carbonate beverages for human consumption and is also the gas released by dry ice. The use of CO_2 by WS for euthanasia purposes is exceedingly minor and inconsequential to the amounts used for other purposes by society.

DRC-1339. For more than 30 years, DRC-1339 has proven to be an effective method of starling, blackbird, gull, and pigeon control at feedlots, dairies, airports, and in urban areas (DeCino et al. 1966, Besser et al. 1967, West et al. 1967). Studies continue to document the effectiveness of DRC-1339 in resolving blackbird/starling problems at feedlots (West and Besser 1976, Glahn 1982, Glahn et al. 1987), and dispersing crow roosts in urban/suburban areas (Boyd and Hall 1987). Glahn and Wilson (1992) noted that baiting with DRC-1339 is a cost-effective method of reducing damage by blackbirds to sprouting rice.

DRC-1339 is a slow acting avicide that is registered with the EPA for reducing damage from several species of birds, including blackbirds, starlings, pigeons, crows, ravens, magpies, and gulls. DRC-1339 was developed as an avicide because of its differential toxicity to mammals. DRC-1339 is highly toxic to sensitive species but only slightly toxic to non-sensitive birds, predatory birds, and mammals (Schafer, Jr.

1981, Schafer, Jr. 1991, Johnston et al. 1999). For example, starlings, a highly sensitive species, require a dose of only 0.3 mg/bird to cause death (Royall et al. 1967). Most bird species that are responsible for damage, including starlings, blackbirds, pigeons, crows, magpies, and ravens are highly sensitive to DRC-1339. Many other bird species such as raptors (Schafer, Jr. 1981), sparrows, and eagles are classified as non-sensitive. Numerous studies show that DRC-1339 poses minimal risk of primary poisoning to non-target and T&E species (EPA 1995). Secondary poisoning has not been observed with DRC-1339 treated baits, except crows eating gut contents of pigeons (Kreps 1974). During research studies, carcasses of birds which died from DRC-1339 were fed to raptors and scavenger mammals for 30 to 200 days with no symptoms of secondary poisoning observed (Cunningham et al. 1981). This can be attributed to relatively low toxicity to species that might scavenge on blackbirds and starlings killed by DRC-1339 and its tendency to be almost completely metabolized in the target birds which leaves little residue to be ingested by scavengers. Secondary hazards of DRC-1339 are almost nonexistent (Schafer, Jr. 1984, Schafer, Jr. 1991, Johnston et al. 1999). DRC-1339 acts in a humane manner producing a quiet and apparently painless death.

DRC-1339 is unstable in the environment and degrades rapidly when exposed to sunlight, heat, or ultra violet radiation. DRC-1339 is highly soluble in water but does not hydrolyze and degradation occurs rapidly in water. DRC-1339 tightly binds to soil and has low mobility. The half-life is about 25 hours, which means it is nearly 100% broken down within a week, and identified metabolites (*i.e.*, degradation chemicals) have low toxicity. Although DRC-1339 is highly toxic to aquatic invertebrates (EPA 1995), following labeling requirements eliminates the risks to non-target mussel species. These label requirements include application more than 50 feet from a body of water, observation and pre-baiting to ensure the rapid uptake of treated bait by the target bird species.

APPENDIX C

Bird Species Addressed in the EA

Chen caerulescens	Snow Goose	*Rallus limicola*	Virginia Rail
Branta bernicla	Brant	*Porzana carolina*	Sora
Branta canadensis	Canada Goose	*Gallinula galeata*	Common Gallinule
Aix sponsa	Wood Duck	*Fulica americana*	American Coot
Anas acuta	Northern Pintail	*Pluvialis dominica*	American Golden-Plover
Anas crecca	Green-winged Teal	*Pluvialis squatarola*	Black-bellied Plover
Anas discors	Blue-winged Teal	*Charadrius semipalmatus*	Semipalmated Plover
Anas platyrhynchos	Mallard	*Charadrius vociferus*	Killdeer
Anas rubripes	American Black Duck	*Actitis macularius*	Spotted Sandpiper
Lophodytes cucullatus	Hooded Merganser	*Tringa flavipes*	Lesser Yellowlegs
Mergus merganser	Common Merganser	*Tringa melanoleuca*	Greater Yellowlegs
Bonasa umbellus	Ruffed Grouse	*Tringa solitaria*	Solitary Sandpiper
Meleagris gallopavo	Wild Turkey	*Arenaria interpres*	Ruddy Turnstone
Gavia immer	Common Loon	*Calidris alba*	Sanderling
Phalacrocorax auritus	Double-crested Cormorant	*Calidris alpina*	Dunlin
Botaurus lentiginosus	American Bittern	*Calidris bairdii*	Baird's Sandpiper
Ixobrychus exilis	Least Bittern	*Calidris fuscicollis*	White-rumped Sandpiper
Ardea alba	Great Egret	*Calidris maritima*	Purple Sandpiper
Ardea herodias	Great Blue Heron	*Calidris melanotos*	Pectoral Sandpiper
Butorides virescens	Green Heron	*Calidris minutilla*	Least Sandpiper
Nycticorax nycticorax	Black-crowned Night-heron	*Calidris pusilla*	Semipalmated Sandpiper
Coragyps atratus	Black Vulture	*Limnodromus griseus*	Short-billed Dowitcher
Cathartes aura	Turkey Vulture	*Limnodromus scolopaceus*	Long-billed Dowitcher
Pandion haliaetus	Osprey	*Scolopax minor*	American Woodcock
Haliaeetus leucocephalus	Bald Eagle	*Larus philadelphia*	Bonaparte's Gull
Circus cyaneus	Northern Harrier	*Larus ridibundus*	Black-headed Gull
Accipiter cooperii	Cooper's Hawk	*Larus argentatus*	Herring Gull
Accipiter gentilis	Northern Goshawk	*Larus delawarensis*	Ring-billed Gull
Accipiter striatus	Sharp-shinned Hawk	*Larus marinus*	Great Black-backed Gull
Buteo jamaicensis	Red-tailed Hawk	* *Columba livia*	Rock Pigeon
Buteo lagopus	Rough-legged Hawk	*Zenaida macroura*	Mourning Dove

Buteo lineatus	Red-shouldered Hawk
Buteo platypterus	Broad-winged Hawk
Falco columbarius	Merlin
Falco peregrinus	Peregrine Falcon
Falco sparverius	American Kestrel
Asio otus	Long-eared Owl
Aegolius acadicus	Northern Saw-whet Owl
Chaetura pelagica	Chimney Swift
Megaceryle alcyon	Belted Kingfisher
Melanerpes carolinus	Red-bellied Woodpecker
Melanerpes erythrocephalus	Red-headed Woodpecker
Sphyrapicus varius	Yellow-bellied Sapsucker
Picoides arcticus	Black-backed Woodpecker
Picoides pubescens	Downy Woodpecker
Picoides villosus	Hairy Woodpecker
Colaptes auratus	Northern Flicker
Dryocopus pileatus	Pileated Woodpecker
Contopus cooperi	Olive-sided Flycatcher
Contopus virens	Eastern Wood-Pewee
Sayornis phoebe	Eastern Phoebe
Tyrannus tyrannus	Eastern Kingbird
Lanius excubitor	Northern Shrike
Cyanocitta cristata	Blue Jay
Corvus brachyrhynchos	American Crow
Corvus corax	Common Raven
Corvus ossifragus	Fish Crow
Eremophila alpestris	Horned Lark
Progne subis	Purple Martin
Tachycineta bicolor	Tree Swallow
Riparia riparia	Bank Swallow
Petrochelidon pyrrhonota	Cliff Swallow

Tyto alba	Barn Owl
Megascops asio	Eastern Screech-Owl
Bubo scandiacus	Snowy Owl
Bubo virginianus	Great Horned Owl
Strix varia	Barred Owl
Asio flammeus	Short-eared Owl
Toxostoma rufum	Brown Thrasher
* *Sturnus vulgaris*	European Starling
Bombycilla cedrorum	Cedar Waxwing
Plectrophenax nivalis	Snow Bunting
Spizella passerina	Chipping Sparrow
Spizella pusilla	Field Sparrow
Passerculus sandwichensis	Savannah Sparrow
Ammodramus savannarum	Grasshopper Sparrow
Melospiza melodia	Song Sparrow
Zonotrichia albicollis	White-throated Sparrow
Zonotrichia leucophrys	White-crowned Sparrow
Junco hyemalis	Dark-eyed Junco
Cardinalis cardinalis	Northern Cardinal
Pheucticus ludovicianus	Rose-breasted Grosbeak
Dolichonyx oryzivorus	Bobolink
Agelaius phoeniceus	Red-winged Blackbird
Sturnella magna	Eastern Meadowlark
Euphagus carolinus	Rusty Blackbird
Quiscalus quiscula	Common Grackle
Molothrus ater	Brown-headed Cowbird
* *Carpodacus mexicanus*	House Finch
Carpodacus purpureus	Purple Finch
Spinus tristis	American Goldfinch
Coccothraustes vespertinus	Evening Grosbeak
* *Passer domesticus*	House Sparrow

Hirundo rustica	Barn Swallow
Baeolophus bicolor	Tufted Titmouse
Troglodytes aedon	House Wren
Sialia sialis	Eastern Bluebird
Catharus guttatus	Hermit Thrush
Hylocichla mustelina	Wood Thrush
Turdus migratorius	American Robin
Dumetella carolinensis	Gray Catbird
Mimus polyglottos	Northern Mockingbird

APPENDIX D

USFWS Listing of Threatened and Endangered Species in Vermont

SPECIES LISTED BY THE U.S. FISH AND WILDLIFE SERVICE[1]

[1]List obtained from < http://ecos.fws.gov/tess_public/reports/species-listed-by-state-report?state=VT&status=listed

Listed species believed to or known to occur in Vermont

Notes:

- As of 02/13/2015 the data in this report has been updated to use a different set of information. Results are based on where the species is believed to or known to occur. The FWS feels utilizing this data set is a better representation of species occurrence. Note: there may be other federally listed species that are not currently known or expected to occur in this state but are covered by the ESA wherever they are found; Thus if new surveys detected them in this state they are still covered by the ESA. The FWS is using the best information available on this date to generate this list.
- This report shows listed species or populations believed to or known to occur in Vermont
- This list does not include experimental populations and similarity of appearance listings.
- This list includes species or populations under the sole jurisdiction of the National Marine Fisheries Service.
- Click on the highlighted scientific names below to view a Species Profile for each listing.

Listed species -- 4 listings

Animals -- 2 listings

Status	Species/Listing Name
E	**Bat, Indiana Entire (Myotis sodalis)**
T	**Bat, Northern long-eared (Myotis septentrionalis)**
E	**Wedgemussel, dwarf Entire (Alasmidonta heterodon)**

Plants -- 2 listings

Status	Species/Listing Name
E	Bulrush, Northeastern (*Scirpus ancistrochaetus*)
E	Milk-vetch, Jesup's (*Astragalus robbinsii var. jesupi*)

Animal species listed in this state that do not occur in this state (5 species)

Status	Species
E	Beetle, American burying Entire (*Nicrophorus americanus*)
T	Lynx, Canada (Contiguous U.S. DPS) (*Lynx canadensis*)
E	Puma (=cougar), eastern Entire (*Puma (=Felis) concolor couguar*)
T	Tiger beetle, Puritan Entire (*Cicindela puritana*)
E	Wolf, gray U.S.A.: All of AL, AR, CA, CO, CT, DE, FL, GA, KS, KY, LA, MA, MD, ME, MO, MS, NC, NE, NH, NJ, NV, NY, OK, PA, RI, SC, TN, VA, VT and WV; those portions of AZ, NM, and TX not included in an experimental population; and portions of IA, IN, IL, ND, OH, OR, SD, UT, and WA. Mexico. (*Canis lupus*)

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

Status	Species
T	Pogonia, small whorled (*Isotria medeoloides*)

APPENDIX E

State Listing of Threatened and Endangered Species in Vermont

[1]List obtained from
http://www.vtfishandwildlife.com/library/Reports_and_Documents/NonGame_and_Natural_Heritage/Rare_Threatened_and_Endangered_Species%20%20---%20lists/Endangered%20and%20Threatened%20Animals%20of%20Vermont.pdf

VERMONT LISTING OF THREATENED AND ENDANGERED SPECIES

The species in the following list are protected by **Vermont's Endangered Species Law (10 V.S.A. Chap. 123)**. There are 32 state-endangered and 14 state-threatened animals in Vermont. Those with a federal status of Threatened or Endangered are also protected by the **Federal Endangered Species Act (P.L. 93-205)**. Other species lists, including lists of common species and rare species not protected by Endangered Species Law, can be found on the Natural Heritage Inventory website, http://www.vtfishandwildlife.com/wildlife_nongame.cfm. For further information contact the Vermont Natural Heritage Inventory, Vermont Fish & Wildlife Department.

Department, 1 National Life Drive, Montpelier, VT 05620-3702. (802) 241-3700.

State Status - Legal protection under Vermont Endangered Species Law (10 V.S.A. Chap. 123)
E = Endangered: in immediate danger of becoming extirpated in the state
T = Threatened: with high possibility of becoming endangered in the near future
Federal Status - Legal protection under the federal Endangered Species Act, U.S. Fish & Wildlife Service
LE = Listed Endangered
LT = Listed Threatened
SC = Species of Concern (does not denote legal protection)
C = Candidate for Listing (does not denote legal protection)

Common Name	Scientific Name	State Status	Federal Status
Fishes			
Northern Brook Lamprey	*Ichthyomyzon fossor*	E	
American Brook Lamprey	*Lampetra appendix*	T	
Lake Sturgeon	*Acipenser fulvescens*	E	
Stonecat	*Noturus flavus*	E	
Eastern Sand Darter	*Ammocrypta pellucida*	T	
Channel Darter	*Percina copelandi*	E	
Amphibians			
Boreal Chorus Frog	*Pseudacris maculata*	E	

Reptiles

Spotted Turtle	*Clemmys guttata*	E	
Spiny Softshell (Turtle)	*Apalone spinifera*	T	
Common Five-lined Skink	*Plestiodon fasciatus*	E	
North American Racer	*Coluber constrictor*	T	
Eastern Ratsnake	*Pantherophis alleghaniensis*	T	
Timber Rattlesnake	*Crotalus horridus*	E	

Mammals

Eastern Small-footed Bat	*Myotis leibii*	T	
Little Brown Bat	*Myotis lucifugus*	E	
Northern Long-eared Bat	*Myotis septentrionalis*	E	
Indiana Bat	*Myotis sodalis*	E	E
Tri-colored Bat	*Perimyotis subflavus*	E	
Canadian Lynx	*Lynx canadensis*	E	LT
Eastern Mountain Lion	*Puma concolor couguar*	E	LE
American Marten	*Martes americana*	E	

Birds

Spruce Grouse	*Falcipennis canadensis*	E	
Bald Eagle	*Haliaeetus leucocephalus*	E	
Upland Sandpiper	*Bartramia longicuada*	E	
Black Tern	*Chlidonias niger*	E	
Common Tern	*Sterna hirundo*	E	
Common Nighthawk	*Chordeiles minor*	E	
Eastern Whip-poor-will	*Caprimulgus vociferus*	T	
Loggerhead Shrike	*Lanius ludovicianus*	E	
Sedge Wren	*Cistothorus platensis*	E	
Henslow's Sparrow	*Ammodramus henslowii*	E	
Grasshopper Sparrow	*Ammodramus savannarum*	T	

Amphipods

Taconic Cave Amphipod	*Stygobromus borealis*	E	

Freshwater Mussels

Eastern Pearlshell	*Margaritifera margaritifera*	T	
Dwarf Wedgemussel	*Alasmidonta heterodo*	E	LE
Brook Floater	*Alasmidonta varicosa*	T	
Cylindrical Papershell	*Anodontoides ferussacianus*	E	

Pocketbook	*Lampsilis ovata*	E
Fluted-shell	*Lasmigona costata*	E
Fragile Papershell	*Leptodea fragilis*	E
Black Sandshell	*Ligumia recta*	E
Pink Heelsplitter	*Potamilus alatus*	E
Giant Floater	*Pyganodon grandis*	T

Beetles

Hairy-necked Tiger Beetle	*Cicindela hirticollis*	T
Cobblestone Tiger Beetle	*Cicindela marginipenni*	T
Puritan Tiger Beetle	*Cicindela puritana*	T