

**ENVIRONMENTAL ASSESSMENT
(FINAL)**

**PREDATOR DAMAGE MANAGEMENT IN
NORTH DAKOTA**

Prepared by:

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

In cooperation with:

NORTH DAKOTA GAME AND FISH DEPARTMENT

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TABLE OF CONTENTS

ACRONYMS..... *iii*

CHAPTER 1: NEED FOR ACTION AND SCOPE OF ANALYSIS

1.1 INTRODUCTION 1

1.2 NEED FOR ACTION 3

1.3 SCOPE OF THIS ENVIRONMENTAL ASSESSMENT 13

1.4 RELATIONSHIP OF THIS EA TO OTHER DOCUMENTS 16

1.5 AUTHORITY OF STATE AND FEDERAL AGENCIES 17

1.6 COMPLIANCE WITH LAWS AND STATUTES 18

1.7 DECISIONS TO BE MADE 21

CHAPTER 2: AFFECTED ENVIRONMENT AND ISSUES

2.1 AFFECTED ENVIRONMENT 22

2.2 ISSUES ASSOCIATED WITH PREDATOR DAMAGE MANAGEMENT ACTIVITIES 23

2.3 ISSUES CONSIDERED BUT NOT ANALYZED FOR EACH ALTERNATIVE 27

CHAPTER 3: ALTERNATIVES

3.1 DESCRIPTION OF THE ALTERNATIVES 42

3.2 ALTERNATIVES CONSIDERED BUT NOT ANALYZED IN DETAIL 50

3.3 STANDARD OPERATING PROCEDURES FOR PREDATOR DAMAGE MANAGEMENT 58

3.4 ADDITIONAL STANDARD OPERATING PROCEDURES SPECIFIC TO THE ISSUES 59

CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

4.1 EVALUATION OF SIGNIFICANCE 64

4.2 ENVIRONMENTAL CONSEQUENCES FOR ISSUES ANALYZED IN DETAIL 65

4.3 CUMULATIVE IMPACTS OF ALTERNATIVE 1 BY ISSUE 108

CHAPTER 5: RESPONSES TO PUBLIC COMMENTS

5.1 SUMMARY OF PUBLIC COMMENTS AND WS’ RESPONSES TO THE COMMENTS 113

CHAPTER 6: LIST OF PREPARERS AND PERSONS CONSULTED

6.1 LIST OF PREPARERS 129

6.2 LIST OF PERSONS CONSULTED 130

APPENDIX A – LITERATURE CITED A-1

APPENDIX B – METHODS AVAILABLE FOR RESOLVING OR PREVENTING PREDATOR
DAMAGE B-1

APPENDIX C – USFWS BIOLOGICAL OPINION: REASONABLE AND PRUDENT MEASURES TO
MINIMIZE GRAY WOLF TAKE C-1

APPENDIX D – NORTH DAKOTA GAME AND FISH DEPARTMENT ANALYSIS OF WS’
FURBEARER TAKE D-1

APPENDIX E - WS’ RESPONSE TO EVALUATION OF STUDIES BY TREVES ET AL. (2016) .. E-1

ACRONYMS

APHIS	Animal and Plant Health Inspection Service
AVMA	American Veterinary Medical Association
BLM	Bureau of Land Management
CDC	Centers for Disease Control and Prevention
CEQ	Council on Environmental Quality
CFR	Codes of Federal Regulations
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FLIR	Forward Looking Infrared
FR	Federal Register
FY	Fiscal Year
IV	Intravenous
IC	Intracardiac
MOU	Memorandum of Understanding
NASS	National Agriculture Statistics Service
NDAC	North Dakota Administrative Code
NDCC	North Dakota Century Code
NDDA	North Dakota Department of Agriculture
NDGFD	North Dakota Game and Fish Department
NEPA	National Environmental Policy Act
NHPA	National Historical Preservation Act
NWRC	National Wildlife Research Center
PEP	Post-exposure Prophylaxis
SOP	Standard Operating Procedure
T&E	Threatened and Endangered
USC	United States Code
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
WS	Wildlife Services

CHAPTER 1: NEED FOR ACTION AND SCOPE OF ANALYSIS

1.1 INTRODUCTION

Wildlife is an important public resource greatly valued by people. Wildlife can have either positive or negative values depending on the perspectives and circumstances of individual people. In general, people regard wildlife as providing economic, recreational, and aesthetic benefits. Knowing that wildlife exists in the natural environment provides a positive benefit to many people. However, the behavior of animals may result in damage to agricultural resources, natural resources, property, and threaten human safety. Animals have no intent to do harm. They utilize habitats (*e.g.*, feed, shelter, reproduce) where they can find a niche. If their activities result in lost value of resources or threaten human safety, people often characterize this as damage. When damage exceeds or threatens to exceed an economic threshold and/or pose 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 many factors can influence when people request assistance (*e.g.*, economic, social, aesthetics). Therefore, what constitutes damage is often unique to the individual person. What one individual person considers damage, another person may not consider as damage. However, the use of the term “*damage*” is consistently used to describe situations where the individual person has determined the losses associated with an animal or animals is actual damage requiring assistance (*i.e.*, has reached an individual threshold). Many people define the term “*damage*” as economic losses to resources or threats to human safety; however, “*damage*” could also occur from a loss in the aesthetic value of property and other situations where the behavior of wildlife was no longer tolerable to an individual person. The threat of damage or loss of resources is often sufficient for people to initiate individual actions and the need for damage management could occur from specific threats to resources.

Native predatory wildlife performs a vital role in a healthy ecosystem; however, predatory animals can also cause damage or pose a threat to resources, including threats to people. The United States Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), Wildlife Services (WS)¹ program in North Dakota continues to receive requests for assistance or anticipates receiving requests for assistance to resolve or prevent damage occurring to agricultural resources, natural resources, and property, including threats to human safety, associated with badgers (*Taxidea taxus*), coyotes (*Canis latrans*), red fox (*Vulpes vulpes*), raccoons (*Procyon lotor*), and striped skunks (*Mephitis mephitis*). In addition to those species, WS could also receive requests for assistance to manage damage and threats of damage associated with bobcats (*Lynx rufus*), mountain lions (*Puma concolor*), feral cats (*Felis domesticus*), feral dogs (*Canis familiaris*), fishers (*Pekania pennanti*), American marten (*Martes americana*), mink (*Neovision vison*), and long-tailed weasels (*Mustela frenata*). However, requests for assistance associated with those species would occur infrequently and/or requests would involve a small number of individuals from a specific species. This document will collectively refer to those mammal species using the term “*predators*”. Collectively, the North Dakota Century Code (NDCC) defines those species as “*furbearers*”, with the exception of striped skunks, feral cats, and feral dogs (see NDCC 20.1-01-02).

Individual damage management projects conducted by the WS program could be categorically excluded from further analysis under the National Environmental Policy Act (NEPA), in accordance with APHIS implementing regulations for the NEPA (7 CFR 372.5(c), 60 FR 6000-6003). The purpose of this Environmental Assessment (EA) is to evaluate cumulatively the individual damage management projects that WS could conduct to manage damage and threats to agricultural resources, property, natural resources, and threats to people caused by predators. This EA will assist in determining if the proposed

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

cumulative management of predator damage could have a significant impact on the environment based on previous activities conducted by WS and based on the anticipation of conducting additional efforts to manage damage caused by those species. Because the goal of WS would be to conduct a coordinated program to alleviate predator damage in accordance with plans, goals, and objectives developed to reduce damage, and because the program's goals and directives² would be to provide assistance when requested, within the constraints of available funding and workforce, it is conceivable that additional damage management efforts could occur. Thus, this EA anticipates those additional efforts and the analyses would apply to actions that may occur in any locale and at any time within North Dakota as part of a coordinated program.

This EA analyzes the potential effects of predator damage management when requested, as coordinated between WS and the North Dakota Game and Fish Department (NDGFD). WS, in cooperation with the NDGFD, is preparing this EA to: 1) facilitate planning, 2) promote interagency coordination, 3) streamline program management, 4) clearly communicate to the public the analysis of individual and cumulative impacts of proposed activities, and 5) evaluate and determine if there would be any potentially significant or cumulative effects from the alternative approaches developed to meet the need for action. The analyses contained in this EA are based on information derived from WS' Management Information System, published documents (see Appendix A), interagency consultations, and public involvement.

The EA evaluates the need for action to manage damage associated with predators in the State, the potential issues associated with managing damage, and the environmental consequences of conducting different alternatives to meet the need for action while addressing the identified issues. WS, in cooperation with the NDGFD, initially developed the issues and alternatives associated with managing damage caused by predators in consultation with the North Dakota Department of Agriculture (NDDA). To assist with identifying additional issues and alternatives to managing damage associated with predators in North Dakota, WS and the NDGFD will make this EA available to the public for review and comment prior to the issuance of a Decision³.

WS previously developed an EA that addressed WS' activities to manage damage associated with predators in the State (USDA 1997)⁴. The previous EA identified the issues associated with managing damage associated with predators and analyzed alternative approaches to meet the specific need identified in the EA while addressing the identified issues. Since this new EA will re-evaluate activities associated with predators to address the need for action and the associated affected environment, the outcome of this Decision for the new EA will supersede the previous EA (USDA 1997) that addressed damage management activities associated with predators. This EA will: (1) assist in determining if the proposed management of damage associated with predators could have a significant impact on the environment for both people and other organisms, (2) analyze several alternatives to address the need for action and the identified issues, (3) coordinate efforts between members of the NDGFD, (4) inform the public, and (5) document the analyses of the environmental consequences of the alternatives to comply with the NEPA. Since this new EA will re-evaluate those activities conducted under the previous EA to address new information, the analyses and the outcome of the Decision issued based on the analyses in this EA will supersede the previous EA that addressed the need to manage predator damage.

²At the time of preparation, WS' Directives occurred at the following web address:
https://www.aphis.usda.gov/aphis/ourfocus/wildlifedamage/SA_WS_Program_Directives.

³After the development of the EA by WS and after public involvement with identifying new issues and alternatives, WS will issue a Decision. Based on the analyses in the EA after public involvement, WS will make a decision to publish a Notice of Intent to prepare an Environmental Impact Statement or WS will issue a Finding of No Significant Impact notice to the public in accordance to the NEPA and the Council of Environmental Quality regulations.

⁴See Section 1.4 of this EA for additional information relating to the previous EA that addressed WS' activities to manage damage associated with predators in North Dakota.

1.2 NEED FOR ACTION

Wildlife damage management is the alleviation of damage or other problems caused by or related to the behavior of wildlife and can be an integral component of wildlife management (Berryman 1991, Reidinger and Miller 2013, The Wildlife Society 2015) and the North American Model of Wildlife Conservation (Geist 2006, Organ et al. 2010). Resolving damage caused by predators requires consideration of both sociological and biological carrying capacities. 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 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 biological carrying capacity of the habitat may support higher populations of wildlife, in many cases the wildlife acceptance capacity is lower or already 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. Therefore, the wildlife acceptance capacity helps define the range of wildlife population levels and associated damages acceptable to individuals or groups (Decker and Brown 2001). A number of factors, including regulated hunting and trapping, influence the impacts of wildlife-related damages. The International Association of Fish and Wildlife Agencies (2005) estimated that without regulated hunting and trapping, wildlife damage to livestock and poultry would increase 221% to an estimated total of \$571 million.

The impacts of wildlife damage within the United States affect a variety of human interests, including the safety of people, crops and livestock, natural resources, and personal property (Conover et al. 1995). When questioned about the negative impacts of wildlife, 80% of ranchers and farmers reported some type of wildlife damage and 53% said the losses exceeded their tolerance limits (Conover 1998). Wywialowski (1994) reported on wildlife-caused losses within the Northern Great Plains of the United States and carnivore predation to livestock-poultry accounted for 17% of the reported losses. The threat of damage or loss of resources is often sufficient for people to initiate individual actions and the need for damage management can occur from specific threats to resources. The need for action to manage damage and threats associated with predators in North Dakota arises from requests for assistance⁵ received by the WS program. Table 1.1 shows the number of projects by resource and species received by the WS program in North Dakota from federal fiscal year⁶ (FY) 2009 through FY 2014.

Between FY 2009 and FY 2014, the WS program conducted 4,558 projects in North Dakota associated with damage caused by those predators addressed in Table 1.1, which represents nearly 760 projects per year. The majority of projects conducted by the WS program in the State were associated with predator damage to agricultural resources, such as cattle, calves, sheep, lambs, and poultry. Nearly 90% of the projects were associated with predator damage to agriculture resources, primarily associated with cattle, calves, sheep, and lambs. Projects were also conducted involving predator damage to goats, horses, poultry, pen-raised wildlife, livestock feed, crops, and pasture between FY 2009 and FY 2014.

⁵The WS program would only conduct predator damage management after receiving a request for assistance. Before initiating damage management activities, WS and the cooperating entity would sign a Memorandum of Understanding, Work Initiation Document, Annual Work Plan, or other comparable document that would list all the methods the property owner or manager would allow WS' personnel to use on property they owned and/or managed.

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

Nearly 87% of the total projects conducted by WS were associated with coyote damage. Of the projects associated with coyote damage, nearly 98% were associated with agricultural resources, primarily predation on livestock. Of those projects conducted by WS between FY 2009 and FY 2014 in the State, over 95% involved damage or threats of damage associated with coyotes, striped skunks, and raccoons.

Requests for assistance are an indication of need, but the requests that WS receives likely represents only a portion of the need in actuality. For example, Connolly (1992) determined that people reported to WS and WS confirms only a fraction of the total predation attributable to coyotes. Connolly (1992) also stated that based on scientific studies and livestock loss surveys generated by the National Agriculture Statistics Service (NASS), WS only confirms about 19% of the total adult sheep and 23% of the lambs actually killed by predators.

Table 1.1 – Resources and species associated with WS’ projects in North Dakota, FY 2009 – FY 2014.

Resource	Species									Total
	Badger	Bobcat	Coyote	Fisher	Red Fox	Mink	Mountain Lion	Raccoon	Striped Skunk	
Agriculture:										
Cattle	0	0	149	0	0	0	4	0	0	153
Calves	0	1	2,235	0	0	0	4	0	0	2,240
Adult sheep	0	0	440	0	0	0	7	0	0	447
Lambs	0	0	881	0	40	0	0	5	0	926
Goats	0	0	47	0	0	0	2	0	0	49
Horses	0	0	20	0	0	0	1	0	0	21
Poultry	0	0	93	6	58	5	0	22	1	185
Pen-raised wildlife	0	0	10	0	0	0	0	0	0	10
Livestock feed	0	0	0	0	1	0	0	21	2	24
Crops	2	0	0	0	0	0	0	14	2	18
Pasture	6	0	0	0	0	0	0	0	0	6
Human Health										
Safety Threats	2	0	27	0	4	0	0	21	118	172
Property										
Buildings	11	0	0	0	5	1	0	50	65	132
Infrastructure	9	0	4	0	0	0	0	0	0	13
Pets	1	1	46	5	8	1	0	2	8	72
Turf/Gardens	37	0	0	0	2	0	0	13	1	53
Miscellaneous	0	0	0	0	0	0	0	19	15	34
Natural Resources										
Least tern	0	0	1	0	0	0	0	0	0	1
Piping plover	0	0	2	0	0	0	0	0	0	2
Total	68	2	3,955	11	118	7	18	167	212	4,558

For example, in most cases when addressing damage to livestock associated with predators, personnel of the WS program would not attempt to locate every livestock reported by ranchers as being killed, but rather personnel would make attempts to verify sufficient losses to establish a need for managing damage and what the appropriate methods would be using the WS Decision Model. Therefore, in many cases, loss reports by the WS program do not actually reflect the total number of livestock or other resources lost in the State, but provide an index of the annual losses. In addition, some people may be unaware of the WS program and may try to resolve damage themselves or request the assistance of other entities.

Need to Manage Predator Damage occurring to Agricultural Resources

During 2001, crop and livestock losses from wildlife in the United States totaled \$944 million, with field crop losses totaling \$619 million, livestock and poultry losses totaling \$178 million, and losses of vegetables, fruits, and nuts totaling \$146 million. Those losses include destruction of or damage to crops in the field and death or injury to livestock. In 2001, the NASS reported that raccoons were responsible for 6%, 3%, and 6% of the total damage to field crops; livestock and poultry; and vegetables, fruits, and nuts, respectively, in the United States (NASS 2002). As shown in Table 1.1, from FY 2009 through FY 2014, the majority of the projects conducted by the WS in North Dakota were associated with damages occurring to agricultural resources. On average, the WS program has conducted nearly 680 projects per year in North Dakota involving predator damage to agricultural resources (see Table 1.1).

Predators are responsible for preying upon a wide variety of livestock, including cattle, sheep, goats, swine, exotic pen-raised game, other hoofed-stock, and poultry. For example, cattle and calves are vulnerable to predation, especially during calving (Bodenchuk et al. 2002). Sheep, goats, and poultry are highly susceptible to predation throughout the year (Henne 1975, Nass 1977, Tigner and Larson 1977, Nass 1980, O’Gara et al. 1983, Bodenchuk et al. 2002). Livestock losses due to predation can cause economic hardships to farmers and ranchers, and without effective ways to reduce predation rates, economic losses from predation can increase (Nass 1977, Howard and Shaw 1978, Nass 1980, Howard and Booth 1981, O’Gara et al. 1983, Bodenchuk et al. 2002). Not all producers suffer losses to predators; however, for those producers that do suffer livestock losses caused by predators, those losses can be economically burdensome (Baker et al. 2008).

Of the predators that kill livestock, coyotes are likely responsible for the highest percentage (Knowlton et al. 1999, Shelton 2004, NASS 2005, NASS 2006, NASS 2010, NASS 2011, APHIS Veterinary Services 2012, APHIS Veterinary Services 2015). In a study of sheep predation on rangelands in Utah, coyotes accounted for 67% of depredated lambs followed by cougar predation at 31% (Palmer et al. 2010). Palmer et al. (2010) replicated a study from the 1970s to determine how predation rates on sheep may have changed over time. Overall, fewer lambs were lost to all causes than during the 1970s (5.8% compared with 9.5%, respectively); however, the proportion of losses to predators did not change substantially. Predators were responsible for 87% of the total lamb losses compared with 83% in the 1970s (Palmer et al. 2010). Coyotes accounted for 93% of all predator-killed lambs and ewes on nine sheep bands in shed lambing operations in southern Idaho and 25% of those sheep killed by coyotes were not fed upon (Nass 1977). DeLorenzo and Howard (1977) found that coyotes were the predominant predator on sheep during a study in Colorado and of those lambs killed by coyotes in the study, more than 43% were not fed upon. Similarly, coyotes were also the primary predator on sheep during a Wyoming study and essentially the only predator in winter (Tigner and Larson 1977).

A positive correlation between predator concentrations and livestock losses due to predation often exists (Shelton and Klindt 1974, Pearson and Caroline 1981, Nunley 1995). When predator concentrations increase, predation loss can be a major factor in cattle, sheep, and goat production. In 2010, the NASS (2011) reported cattle and calf losses from animal predation totaled 219,900 head in the United States according to livestock producers. Animal predation represented 5.5% of the total cattle and calf losses reported by livestock producers in 2010 totaling \$98.5 million in economic losses. Cattle producers identified coyotes as the primary predator of livestock with 53.1% of cattle and calf losses attributed to coyotes in 2010. Producers also attributed livestock losses to bobcats, mountain lions, and dogs. In the United States, Pimentel et al. (2005) estimated that feral dogs caused \$620 million in losses annually. Bergman et al. (2009) provides a summary of the feral dog damage in the United States. Young et al. (2011) stated, “*In human-populated landscapes, dogs...are of the most abundant terrestrial carnivore*” and “*The impacts of dog predation in some cases may be more severe than those of wild predators*”.

Producers spent nearly \$188.5 million dollars on non-lethal methods to reduce cattle and calf losses from predation by animals in 2010 (NASS 2011). The primary non-lethal method employed by livestock producers was the use of guard animals. Of those cattle producers who used non-lethal methods, 36.9% of producers reported using guard animals. Producers also reported using exclusion fencing, frequent checking, and culling as additional employed methods for reducing predation (NASS 2011).

Livestock production in North Dakota contributes substantially to the State's economy. In 2012, the cash receipts from the sale of cattle and calves totaled \$1.1 billion and the cash receipts for sheep and lambs were \$6.8 million (NASS 2014). Economic multipliers, which account for the cumulative effect of additional spending associated with initial commodity values, provide a broader measure of the total economic impacts to regional economies (Petry and Risdal 2002). After applying economic multipliers of 2.7 to the cattle cash receipts and 1.9 to the sheep and lamb cash receipts (United Soybean Board 2013), the economic value of each class of livestock rises to \$3 billion and \$13 million, respectively.

Predation on livestock is well documented, with coyotes the primary predator to cattle (NASS 2006, NASS 2011, APHIS Veterinary Services 2012) and sheep (Schaefer et al. 1981, O'Gara et al. 1983, Nass et al. 1984, Neale et al. 1998, NASS 2010, Sacks and Neale 2007, Palmer et al. 2010, APHIS Veterinary Services 2015). The annual loss of all classes of livestock to predation varies by year and by location (Baker et al. 2008). For example, coyotes were responsible for 64% of the cattle and calf predation in North Dakota in 2005, with total losses equaling \$1.5 million (NASS 2006). However, in 2010, coyotes were responsible for 86% of cattle and calf predation in North Dakota resulting in \$1.3 million in losses (NASS 2011).

The NASS (2005) reported that predators killed 700 adult sheep and 3,000 lambs in North Dakota during 2004, which were valued at \$88,000 and \$186,000, respectively. In 2009, the NASS (2010) reported that predators killed 500 adult sheep and 1,400 lambs in the State, which were valued at \$69,000 and \$85,000, respectively. In 2014, the APHIS Veterinary Services (2015) reported that predators killed 480 adult sheep and 2,053 lambs in North Dakota, which were valued at \$470,000. In 2004, survey participants identified coyotes as responsible for 100% of the adult sheep losses associated with animal predators in North Dakota and 93% of the lambs lost to predators, while dogs accounted for nearly 7% of the lambs lost (NASS 2005). In 2014, the APHIS Veterinary Services (2015) reported that survey participants identified coyotes as responsible for 100% of the adult sheep lost to predators in the State and 97% of the lambs lost to animal predators.

Cattle and calf predation losses due to predators in North Dakota totaled 500 and 2,300 head valued at over \$1.5 million in 2005 (NASS 2006) and 300 and 2,500 head valued at nearly \$1.3 million in 2010 (NASS 2011). Of the animal predators identified as causing losses to cattle in 2010, coyotes were responsible for about 86% of the losses, while people attributed 14% of the losses to unknown predators (NASS 2011). Of the calf loss, coyotes, mountain lions/bobcats, and dogs were responsible for 86%, 4%, and 2% of the losses, respectively (NASS 2011). Those losses represent direct costs to the producer (*e.g.*, value of the animal and its wool or mohair). Livestock producers often incur indirect costs associated with livestock predation in addition to the direct loss from animals killed by predators, such as the implementation of methods to reduce predation rates (Jahnke et al. 1987). Economic losses associated with predation on livestock often occur despite efforts by livestock producers to reduce predation rates. Predation results in lost profitability for livestock producers because of decreases in the number of animals available for sale plus the costs of mitigating the predation (Rashford et al. 2010).

In 2010, predation on cattle throughout the United States resulted in losses totaling \$98.5 million, while at the same time ranchers and farmers spent \$189 million on non-lethal predator damage management measures such as guard animals and fencing (NASS 2011). The NASS (2005) reported that North Dakota

sheep producers used non-lethal methods to reduce predator damage. Producers in North Dakota used night penning, guard dogs, llamas, fencing, other non-lethal methods, donkeys, frequent checks, lamb shed, culling, frightening tactics, bedding change, carrion removal, and herding to reduce predation. In 2014, the APHIS Veterinary Services (2015) reported that North Dakota sheep producers used guard dogs, llamas, donkeys, fencing, lamb shed, herding, night penning, fright tactics, removing carrion, culling, change bedding, frequent checks, altered breeding season, and other non-lethal methods. The NASS (2011) also reported that North Dakota cattle producers used guard animals, culling, frequent checks, carcass removal, exclusion fencing, fright tactics, herding, night penning, and other non-lethal methods to reduce predation.

In a 2-year study of goat production in South Texas, Guthery and Beasom (1978) reported predators, primarily coyotes, killed 33 to 95% of the known kid crop on pastures with no predator management. Overall, predation rates on goats in studies of goat losses in the absence of management exceeded 50% (Bodenchuk et al. 2002). During short-term fencing tests conducted in Texas, Shelton and Wade (1979) reported that predators killed all of the kids and lambs within the study area.

Need to Manage Damage Occurring to Property

Predators can cause damage to a variety of property types in North Dakota each year. Property damage can occur in a variety of ways. Predator damage to property occurs primarily through direct damage to structures. Accumulations of fecal droppings can cause damage to buildings and other structures where raccoons or feral cats frequent. Aircraft striking predators can also cause substantial damage requiring costly repairs and aircraft downtime. Raccoons and skunks can cause damage to property by digging under porches, buildings, homes, and other places. Skunks and raccoons can cause damage to lawns and landscaping while digging for grubs and insects. Coyotes can attack companion animals.

Airports provide ideal conditions for many wildlife species due to the large open grassy areas adjacent to brushy, forested habitat used as noise barriers. Access to most airport properties is restricted so predators living within airport boundaries are not usually harvestable during hunting and trapping seasons and would be insulated from many other human disturbances.

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, Dolbeer 2009). 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, Thorpe 1997, Keirn et al. 2010). Aircraft collisions with wildlife can also erode public confidence in the air transport industry as a whole (Conover et al. 1995).

Between 1990 and 2014, there were 3,360 reported aircraft strikes involving terrestrial mammals in the United States (Dolbeer et al. 2015). The number of mammal strikes actually occurring is likely to be much greater, since Dolbeer (2009) estimated 39% of civil wildlife strikes are actually reported. Aircraft have collided with a reported 41 species of terrestrial mammals from 1990 through 2014, including raccoons, fox, cats, coyotes, dogs, and striped skunks (Dolbeer et al. 2015). Of the terrestrial mammals reported struck by aircraft, 37% were carnivores (primarily coyotes), causing over \$4.3 million in damages (Dolbeer et al. 2015). Aircraft striking coyotes have resulted in 14,135 hours of aircraft downtime and nearly \$3.8 million in damages to aircraft in the United States since 1990 (Dolbeer et al. 2015). Aircraft strikes involving dogs have caused over \$400,000 in damage in the United States since 1990 (Dolbeer et al. 2015). Between 1990 and 2012, Crain et al. (2015) estimated that aircraft strikes involving carnivores (primarily coyotes) caused \$7 million in damages to aircraft.

In addition to direct damage, an aircraft striking a predator can pose serious threats to human safety if the damage from the strike causes a catastrophic failure of the aircraft leading to a crash. For example, damage to the landing gear during the landing roll and/or takeoff run can cause a loss of control of the aircraft, causing additional damage to the aircraft and increasing the threat to human safety. Nearly 64% of the reported mammal strikes from 1990 through 2014 occurred at night, with most strikes occurring during the landing roll or the takeoff run (Dolbeer et al. 2015).

Since 1990, aircraft have struck one skunk (species not indicated), four striped skunks, one fox (species not indicated), one red fox, and one coyote in North Dakota according to reports filed with the Federal Aviation Administration (FAA) (FAA 2015). Airports and military facilities in North Dakota could request assistance with managing threats to human safety and damage to property associated with predators present inside the area of operations of airports. The infrequency of predator strikes does not lessen the need to prevent threats to human safety and the prevention of damage to property. Preventing damage and reducing threats to human safety is the goal of those cooperators requesting assistance at airports in the State given that a potential strike could lead to the loss of human life and considerable damage to property.

Wildlife populations near or found confined within perimeter fences at airports or military facilities can be a threat to human safety and cause damage to property when struck by aircraft. Those animals confined inside an airport perimeter fence would not be considered distinct populations nor separate from those populations found outside the perimeter fence. Animals found within the boundaries of perimeter fences originate from populations outside the fence. Those individuals of a species inside the fence neither exhibit nor have unique characteristics from those individuals of the same species that occur outside the fence; therefore, those individuals of a species confined inside an airport perimeter fence do not warrant consideration as a unique population under this analysis.

The WS program could respond to requests from airports, landowners, and other property owners to alleviate property damage from predators in the State. WS could respond to requests for assistance associated with the threat of predators being struck by aircraft at airports, raccoons and skunks burrowing into or under homes, skunks and raccoons gaining access into a home through a pet door to eat pet food, and skunks causing damage to landscaping, gardens, and golf courses from feeding activities.

Predators can kill or injure pets and zoo animals, especially in urban and suburban areas. Predators in suburban and urban areas often have adapted to human altered habitats and have acclimated to the presence of people. For example, coyotes can be territorial and aggressive, especially during the breeding season and especially toward other canids, such as dogs. When coyotes adapt to and acclimate to the presence of people, they can act aggressive and attack pet dogs, even when people walk those dogs on a leash. Deer are a primary food source for mountain lions. Deer often thrive in urban and suburban areas due to availability of food and water. The presence of high deer densities in urban and suburban areas can attract mountain lions to those areas. Pets and zoo animals often are easy prey items for mountains lions because they are confined inside an enclosure or are generally less wary than other prey.

Need to Manage Damage Occurring to Natural Resources

Natural resources may be described as those assets belonging to the public and often managed and held in trust by government agencies as representatives of the people. Such resources may be plants or animals, including threatened or endangered species, historic properties, or habitats in general. Examples of natural resources are parks and recreation areas; natural areas, including unique habitats or topographic features; threatened and endangered plants or animals; and any plant or animal populations that have been identified by the public as a natural resource.

Predation is one of many mortality factors that influence wildlife populations. Predators often play critical roles in the composition and function of wildlife populations in ecosystems (Witmer et al. 1996). Normally, predation by native predators would be considered part of the function of a healthy ecosystem. Many of the predators addressed in this EA are native to the State of North Dakota; however, many changes have occurred in the ecosystem of the State, which has disrupted natural predator-prey relationships. Many of the changes that have occurred can be attributed to human influence, including habitat fragmentation, landscape alteration, and environmental contamination. In addition, human habitation alone can often alter the biological carrying capacity of a local environment. Some species, such as raccoons and skunks, can live in high densities because of human activity. Those same human-induced changes can negatively affect the viability of some native wildlife populations.

Declines in bird populations associated with habitat loss and fragmentation may be compounded by predation (Cote and Sutherland 1997). The effects of predation on birds can be detrimental to local populations; especially, when predator densities are high or when predators gain access to areas not historically occupied (Stoudt 1982, Bailey 1993). In general, ground nesting birds suffer the highest predation rates (DeVos and Smith 1995).

Under some circumstances, managing predation can be an important tool in maintaining specific wildlife management objectives. Managing game species in North Dakota is the responsibility of the NDGFD and any decision to manage predation to benefit local game populations would be the responsibility of the NDGFD. However, WS could provide assistance if requested by the NDGFD. A major goal of WS would be to provide protection and conduct actions in areas where data suggests that managing predators would likely be effective and successful (Ballard et al. 2001).

WS could receive requests to assist with preventing predation on other wildlife species. If a management agency finds that predation could adversely affect a particular species, WS could assist in determining if damage management efforts could help protect the species and implement necessary, if any, actions to prevent predation. In many cases, requests for assistance to manage damage to natural resources involve threatened or endangered species.

Need to Reduce Threats Occurring to Human Safety

Zoonoses (*i.e.*, wildlife diseases transmissible to people) are a major concern of cooperators when requesting assistance with managing threats from predators. Disease transmission could occur from direct interactions between people and animals or from interactions with pets and livestock that have direct contact with wild predators. Pets and livestock often encounter and interact with wild mammals, which can increase the opportunity of transmission of disease to humans. These include viral, bacterial, mycotic (fungal), protozoal, and rickettsial diseases.

Individuals or property owners that request assistance with disease threats frequently are concerned about potential disease risks but are unaware of the types of diseases that can be transmitted by those animals. In those types of situations, assistance is requested because of a perceived risk to human health or safety associated with wild animals living in close association with people, from animals acting out of character by roving in human-inhabited areas during daylight, or from animals showing no fear when people are present. In many circumstances when human health concerns are the primary reason for requesting assistance there may have been no actual cases of transmission of disease to humans by predators. Thus, the risk of disease transmission would be the primary reason for requesting assistance from WS.

The most common disease concern expressed by individuals requesting assistance is the threat of rabies transmission to people, pets, and companion animals. Rabies is an acute, fatal viral disease of mammals most often transmitted through the bite of a rabid animal that poses an indirect and direct threat to

humans. Indirect threats to humans occur from exposure from pets or livestock that have been infected from bites of a rabid animal. Direct threats can occur from handling infected wildlife or from aggressive animal behavior caused by rabies. The disease can be effectively prevented in humans when exposure is identified early and treated. In addition, domestic animals and pets can be vaccinated for rabies. However, the abundant and widely distributed reservoir among wild mammals complicates rabies control. The vast majority of rabies cases reported to the Centers for Disease Control and Prevention (CDC) each year occur in raccoons, skunks (primarily *Mephitis mephitis*), and bats (Order Chiroptera) (CDC 2011).

Over the last 100 years, the vector of rabies in the United States has changed dramatically. About 90% or greater of all animal cases reported annually to CDC now occur in wildlife (Krebs et al. 2000, CDC 2011). Before 1960, the majority of cases were reported in domestic animals. The principal rabies hosts today are wild carnivores and bats. The number of rabies-related human deaths in the United States has declined from more than 100 annually in the early 1900s to an average of one or two people per year in the 1990s. Modern day prophylaxis, which is the series of vaccine injections given to people who have been potentially or actually exposed, has proven nearly 100% successful in preventing mortality when administered promptly (CDC 2011). In the United States, human fatalities associated with rabies occur in people who fail to seek timely medical assistance, usually because they were unaware of their exposure to rabies. Although human rabies deaths are rare, the estimated public health costs associated with disease detection, prevention, and control have risen, exceeding \$300 million annually. Those costs include the vaccination of companion animals, maintenance of rabies laboratories, medical costs such as those incurred for exposure case investigations, rabies post-exposure prophylaxis (PEP), and animal control programs (CDC 2011).

Accurate estimates of the aforementioned expenditures are not available. Although the number of PEPs given in the United States each year is unknown, it has been estimated to be as high as 40,000. When rabies becomes epizootic (*i.e.*, affecting a large number of animals over a large area) or enzootic (*i.e.*, present in an area over time but with a low case frequency) in a region, the number of PEPs in that area often increases. Although the cost varies, a course of rabies immunoglobulin and five doses of vaccine given over a 4-week period typically exceeds \$1,000 (CDC 2011) and has been reported to be as high as \$3,000 or more (Meltzer 1996). As epizootics spread in wildlife populations, the risk of “mass” human exposures requiring treatment of large numbers of people that contact individual rabid domestic animals infected by wild rabid animals increases. One case in Massachusetts involving contact with, or drinking milk from, a single rabid cow required PEPs for 71 persons (CDC 1999). The total cost of this single incident exceeded \$160,000 based on a median cost of \$2,376 per PEP in Massachusetts. Likely, the most expensive single mass exposure case on record in the United States occurred in 1994 when a kitten from a pet store in Concord, New Hampshire tested positive for rabies after a brief illness. Because of potential exposure to the kitten or to other potentially rabid animals in the store, at least 665 persons received post-exposure rabies vaccinations at a total cost of more than \$1.1 million (Noah et al. 1995). The American Veterinary Medical Association (AVMA) estimated the total cost for this specific incident, including investigation, laboratory testing, and rabies immunoglobulin and vaccines was more than \$1.5 million (AVMA 2004).

Rabies presents a human health threat through potential direct exposure to rabid animals, or indirectly through the exposure of pets that have an encounter with rabid animals. Additionally, the number of pets and livestock examined and vaccinated for rabies, the number of diagnostic tests requested, and the number of post exposure treatments can increase when rabies is present in an area. Human and financial resources allocated to rabies-related human and animal health needs also increase, often at the expense of other important activities and services.

Skunks are an important wildlife host for the rabies virus in North America and are second only to raccoons in being the most commonly reported rabid wildlife species in the United States (Majumdar et

al. 2005). The skunk variant of rabies may be found in the Midwest and California; however, skunks found throughout North America may be infected with different variants of rabies such as the raccoon variant. The distribution of rabies in skunks extends from Georgia to Maine east of the Appalachians, Texas to the Canadian border, and throughout the northern two thirds of California (Majumdar et al. 2005).

Increasing populations of raccoons have been implicated in the outbreak of distemper in certain areas (Majumdar et al. 2005). Distemper has not been identified as transmissible to humans. However, cooperators who feel threatened by the possibility of disease transmission often request assistance after observing sick raccoons on their property. Symptoms of distemper often lead to abnormal behavior in raccoons that are similar to symptoms associated with rabies. Raccoons with distemper often lose their fear of humans and can act aggressively which increases the risk that people, livestock, or companion animals may be bitten. Distemper is also known to occur in coyotes and red fox with symptoms that are similar to those exhibited by animals infected with the rabies virus.

Diseases and parasites affecting feral cats and dogs can have particularly serious implications to human health given the close association of those animals with humans and companion animals. The topic of feral animals and their impacts on native wildlife and human health elicits a strong response in numerous professional and societal groups with an interest in the topic. Feral cats and dogs are considered by most professional wildlife groups to be a non-native species that can have detrimental effect to the native ecosystems especially in the presence of a human altered landscape. However, a segment of society views feral animals to be an extension of companion animals that should be cared for and for which affection bonds are often developed especially when societal groups feed and care for individual feral animals. Of special concern are those cats and dogs considered companion animals that are not confined indoors at all times but are allowed to range outside the home for extended periods. If interactions occur between companion animals and feral animals of the same species, companion animals could become exposed to a wide-range of zoonoses that could be brought back into the home where direct contact between the companion animal and people increases the likelihood of disease transmission. Feral animals that are considered companion animals are also likely to affect multiple people if disease transmission occurs since those animals are likely to come in direct contact with several members of families and friends before diagnosis of a disease occurs.

Several known diseases that are infectious to people, including rabies, have been found in feral cats and dogs. A common zoonosis found in cats is ringworm. Ringworm (*Tinea* spp.) is a contagious fungal disease contracted through direct interactions with an infected person, animal, or soil. Other common zoonoses of cats are pasteurella, salmonella, cat scratch disease, and numerous parasitic diseases, including roundworms, tapeworms, and toxoplasmosis.

This discussion on zoonoses is intended to briefly address the more common known zoonoses found in the United States for those species specifically addressed in this EA but is not intended to be an exhaustive discussion of all potential zoonoses. The transmission of diseases from wildlife to humans is neither well documented nor well understood for most infectious zoonoses. Determining a vector for a human infected with a disease known to occur in wildlife populations is often complicated by the presence of the known agent across a broad range of naturally occurring sources. For example, a person with salmonella poisoning may have contracted salmonella bacterium from direct contact with an infected pet but may have also contracted the bacterium from eating undercooked meat or from other sources.

Disease transmission directly from wildlife to humans is uncommon. However, the infrequency of such transmission does not diminish the concerns of those individuals requesting assistance that are fearful of exposure to a diseased animal since disease transmissions have been documented to occur. The WS program actively attempts to educate the public about the risks associated with disease transmission from

wildlife to humans through technical assistance and by providing technical leaflets on the risks of exposure.

In addition to disease transmission threats, requests are also received for assistance from perceived threats of physical harm from wildlife, especially from predatory wildlife. Human encroachment into wildlife habitat increases the likelihood of human-wildlife interactions. Those species that people are likely to encounter are those most likely to adapt to and thrive in human altered habitat. Several predatory and omnivorous wildlife species thrive in urban habitat due to the availability of food, water, and shelter. Many people enjoy wildlife to the point of purchasing food specifically for feeding wildlife despite laws prohibiting the act in many areas. The constant presence of human created refuse, readily available water supplies, and abundant rodent populations found in some areas often increases the survival rates and carrying capacity of wildlife species that are adaptable to those habitats. Often the only limiting factor of wildlife species in and around areas inhabited by people is the prevalence of diseases, which can be confounded by the overabundance of wildlife congregated into a small area that can be created by the unlimited amount of food, water, and shelter found within those habitats.

As people are increasingly living with wildlife, the lack of harassing and threatening behavior by people toward many species of wildlife has led to a decline in the fear wildlife have toward people. When wildlife species begin to habituate to the presence of humans and human activity, a loss of apprehension occurs that can lead to threatening behavior toward humans. This threatening behavior continues to increase as human populations expand and the populations of those species that adapt to human activity increase. Threatening behavior can be in the form of aggressive posturing, a general lack of apprehension toward people, or abnormal behavior. Although wildlife attacking people occurs rarely, the number of attacks appears to be on the increase. Poessel et al. (2013) discusses the emerging conflicts between people and coyotes in the metropolitan area of Denver, Colorado. Timm et al. (2004) reported that coyotes attacking people have increased in California and the recent, highly publicized coyote attacks, including a fatal attack on a 19-year old woman in Nova Scotia (Canadian Broadcast Company 2009), have only heightened people's awareness of the threat of such encounters. Although attacks on people associated with those species addressed in this EA occurs rarely, requests for assistance to lessen the threat of possible attack do occur from people in the State. Often, wildlife exhibiting threatening behavior or a loss of apprehensiveness to the presence of humans is a direct result and indication of an animal inflicted with a disease. So, requests for assistance are caused by both a desire to reduce the threat of disease transmission and from fear of aggressive behavior either from an animal that is less apprehensive of people or induced as a symptom of disease.

WS has received requests for assistance in the State to reduce human health and safety concerns. Human health and safety concerns may include attacks from coyotes that result in injuries or death, disease threats from rabies and plague outbreaks where predators act as reservoirs, odor and noise nuisances from skunks, opossums, and raccoons in attics and under houses, and aircraft strike hazards from coyotes and fox crossing runways at airports or airbases. Typically, the biggest concern of the public is the threat of attack on people by large predators (*e.g.*, coyotes, mountain lions) despite the rarity of those types of events. For example, Baker and Timm (1998), after several human-coyote interactions in an area, concluded that the use of foothold traps to capture and euthanize a few coyotes would be the best method to limit interactions and have the most lasting effects. After a coyote in Glendale, California, killed a child, city and county officials trapped 55 coyotes in an 80-day period from within one-half mile of the home, an unusually high number for such a small area (Howell 1982). Mountain lion attacks on people in the western United States and Canada have increased in the last two decades, primarily due to increasing mountain lion populations and human use of mountain lion habitats (Beier 1991, Beier 1992). No fatalities associated with predators have been documented in the State. Although predator attacks on people are rare, WS could receive requests for assistance if such attacks occur.

Disease Surveillance and Monitoring

Public awareness and health risks associated with zoonoses (*i.e.*, diseases of animals that can be transmitted to humans) have increased in recent years. Several zoonotic diseases associated with predators are addressed in this EA. Those zoonotic diseases remain a concern and continue to pose threats to human safety where people encounter predators. The WS program has received requests to assist with reducing damage and threats associated with several predator species in North Dakota and could conduct or assist with disease monitoring or surveillance activities for any of the predator species addressed in this EA. Most disease sampling would occur ancillary to other wildlife damage management activities (*i.e.*, disease sampling occurs after wildlife have been captured or lethally removed for other purposes). For example, WS may sample predators harvested during the annual hunting season or during other damage management programs.

1.3 SCOPE OF THIS ENVIRONMENTAL ASSESSMENT

Actions Analyzed

This EA documents the need for managing damage caused by predators, the issues associated with meeting that need, and alternative approaches to address those issues and to meet the need for action. WS' mission is to provide federal leadership with managing damage and threats of damage associated with animals (see WS Directive 1.201). The WS program has developed a Policy Manual to provide guidance to WS' personnel conducting official activities (see WS Directive 1.101). The Policy Manual addresses national policy and provides general direction to WS' personnel. WS' personnel would only provide assistance when the appropriate property manager or property owner requested assistance⁷. WS could receive a request for assistance from a property owner or manager to conduct activities on property they own or manage, which could include federal, state, tribal, municipal, and private land within the State of North Dakota.

Appendix B of this EA discusses the methods available for use or recommendation under each of the alternative approaches evaluated⁸. The alternatives and Appendix B also discuss how the WS program and other entities could recommend or employ methods to manage damage and threats associated with predators in the State. Therefore, the actions evaluated in this EA are the use or recommendation of those methods available under the alternatives and the employment or recommendation of those methods by WS to manage or prevent damage and threats associated with predators from occurring when requested by the appropriate resource owner or manager. Activities that could involve the lethal removal of target predator species by WS under the alternatives would only occur when agreed upon by the requester and when authorized by the NDGFD, when required, and only at levels authorized.

Federal, State, County, City, and Private Lands

WS could continue to provide damage management activities on federal, state, county, municipal, and private land in North Dakota when WS receives a request for such assistance by the appropriate resource owner or manager. When conducting activities on state or federal properties, WS would conduct activities based on interagency relationships, which may require close coordination and cooperation

⁷Prior to providing any direct operational assistance, a MOU, Work Initiation Document, Work plan, or another similar document would be signed between WS and the appropriate property owner or manager that identifies the wildlife species to be addressed and the methods the cooperators have agreed to be implemented on property they own or manage.

⁸Appendix B contains a complete list of chemical and non-chemical methods available for use under the identified alternatives. However, listing methods neither implies that all methods would be used by WS to resolve requests for assistance nor does the listing of methods imply that all methods would be used to resolve every request for assistance.

because of related or overlapping authorities and legal mandates. The WS program in North Dakota would coordinate closely with other federal and state agencies, including the Bureau of Land Management (BLM), the United States Forest Service, the NDGFD, and the NDDA (see Section 1.5 and Section 1.6). Therefore, the scope of this EA analyzes actions that could occur on federal, state, county, city, and private lands, when requested.

Native American Lands and Tribes

WS would only conduct damage management activities on Native American lands when requested by a Native American Tribe. WS would only conduct activities after WS and the Tribe requesting assistance signed a Memorandum of Understanding (MOU), a work initiation document, or a similar document. Therefore, the Tribe would determine what activities would be allowed and when WS' assistance was required. 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 likely occur. Those methods available to alleviate damage associated with predators 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 Tribe requesting WS' assistance approved the use of those methods. Therefore, the activities and methods addressed under the alternatives would include those activities that WS could employ on Native American lands, when requested and when agreed upon by the Tribe and WS.

Period for which this EA is Valid

If the preparation of an Environmental Impact Statement (EIS) is not warranted, based on the analyses associated with this EA, WS would conduct reviews of activities conducted under the selected alternative to ensure those activities occurred within the parameters evaluated in this EA. This EA would remain valid until WS and the NDGFD determined that new needs for action, changed conditions, new issues, or new alternatives having different environmental impacts must be analyzed. At that time, WS and the NDGFD would supplement this analysis or conduct a separate evaluation pursuant to the NEPA. Under the alternative analyzing no involvement by WS, no review or 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 the State under the selected alternative, when requested.

Site Specificity

As mentioned previously, WS would only conduct damage management activities when requested by the appropriate resource owner or manager. In addition, WS' activities that could involve the lethal removal of predators under the alternatives would only occur when authorized by the NDGFD, when required, and only at levels authorized.

This EA analyzes the potential impacts of managing damage caused by predators based on previous activities conducted on private and public lands in the State where WS and the appropriate entities entered into a MOU, work initiation document, annual work plans, or a similar document. This EA also addresses the potential impacts of managing predator damage in areas where WS and a cooperating entity sign additional agreements in the future. Because the need for action would be to reduce damage and because the program's goals and directives would be to provide assistance 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 analyzes the potential effects of those efforts as part of the alternatives.

Many of the predator species addressed in this EA occur statewide and throughout the year in the State; therefore, damage or threats of damage could occur wherever those predators occur. Planning for the management of predator damage must be viewed as being conceptually similar to the actions of other entities whose missions are to stop or prevent adverse consequences from anticipated future events for which the actual sites and locations where they would occur are unknown but could be anywhere in a defined geographic area. Examples of such agencies and programs include fire departments, police departments, emergency clean-up organizations, and insurance companies. Although WS could predict some locations where predator damage would occur, WS could not predict every specific location or the specific time where such damage would occur in any given year. In addition, the threshold triggering an entity to request assistance from WS to manage damage associated with predators is often unique to the individual; therefore, predicting where and when WS would receive such a request for assistance would be difficult. This EA emphasizes major issues as those issues relate to specific areas whenever possible; however, many issues apply wherever predator damage and the resulting management actions occur and this EA treats those issues as such.

Chapter 2 of this EA identifies and discusses issues relating to predator damage management in North Dakota. The standard WS Decision Model (Slate et al. 1992; see WS Directive 2.201) would be the site-specific procedure for individual actions that WS could conduct in the State (see Chapter 3 for a description of the Decision Model and its application). Decisions made using the model would be in accordance with WS' directives (see WS Directive 1.101) and Standard Operating Procedures (SOPs) described in this EA, as well as relevant laws and regulations in accordance with WS Directive 2.210.

The analyses in this EA would apply to any action that may occur by WS in any locale and at any time within North Dakota. In this way, WS believes the program 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 mission of the program.

Summary of Public Involvement

WS initially developed the issues associated with conducting activities to manage damage in cooperation with the NDGFD. WS and the NDGFD defined the issues and identified the preliminary alternatives through the scoping process. As part of this process, and as required by the Council on Environmental Quality (CEQ) and APHIS implementing regulations for the NEPA, WS and the NDGFD will make this document available to the public for review and comment. WS and the NDGFD will make the document available to the public through legal notices published in local print media, through direct notification of parties that have requested notification, or that WS and the NDGFD have identified as having a potential interest in the reduction of threats and damage associated with predators in the State. In addition, WS will post this EA on the APHIS website and the regulations.gov website for review and comment.

WS and the NDGFD 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 and the NDGFD will clearly communicate to the public and interested parties the analyses of potential environmental impacts on the quality of the human environment. WS and the NDGFD would fully consider new issues, concerns, or alternatives the public identifies during the public involvement period to determine whether WS and the NDGFD should revisit the EA and, if appropriate, revise the EA prior to issuance of a Decision.

1.4 RELATIONSHIP OF THIS EA TO OTHER DOCUMENTS

WS' Environmental Assessment - Wildlife Damage Management in North Dakota for the Protection of Livestock, Public Health and Safety, Property, and Wildlife

As was stated previously, WS previously developed an EA that addressed WS' activities to manage damage associated with predators in the State (USDA 1997). This new EA will address more recently identified changes in activities and will assess the potential environmental impacts of program alternatives based on those changes, primarily a need to evaluate new information and additional animal species. Since this new EA will re-evaluate activities conducted under the previous EA to address the need for action and the associated affected environment, the analysis and the outcome of the Decision issued based on the analyses in this EA will supersede the previous EA that addressed managing damage caused by predators.

Environmental Assessment - Proposal to Permit Take as Provided Under the Bald and Golden Eagle Protection Act

The EA developed by the United States Fish and Wildlife Service (USFWS) evaluated the issues and alternatives associated with permitting the “take” of bald eagles and golden eagles as defined under the Bald and Golden Eagle Protection Act. The preferred alternative in the EA evaluated the authorized disturbance of eagles, which constitutes “take” as defined under the Bald and Golden Eagle Protection Act, authorizes the removal of eagle nests where necessary to reduce threats to human safety, and evaluated the issuance of permits authorizing the lethal take of eagles in limited circumstances. A Decision and FONSI was issued for the preferred alternative in the EA (USFWS 2010). 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 (see 74 FR 46836-46879).

National Level Memoranda of Understanding

National level MOUs have been signed between WS and the BLM, between WS and the United States Forest Service, and between WS and the USFWS, which recognize WS' responsibilities for wildlife damage management and related compliance with the NEPA, and outline related roles and responsibilities of each agency.

National Forest Land and Resource Management Plans

The National Forest Management Act requires that each National Forest prepare a Land and Resource Management Plan for guiding long-range management and direction.

BLM Resource Management Plans

The BLM currently uses Resource Management Plans to guide land management decisions on lands it administers. In North Dakota, the BLM offices were consulted during the preparation of this EA to ensure that the EA is consistent with Resource Management Plans. In addition, any work planned on BLM managed lands would be further coordinated with BLM per the national level MOU.

North Dakota Comprehensive Wildlife Conservation Strategy

The NDGFD has developed an extensive state wildlife action plan (Dyke et al. 2015). The intent of the state wildlife action plan is “to identify species of greatest conservation priority, provide fundamental

background information, strategic guidance, input from partners, and most importantly, a framework for developing and coordinating conservation actions to safeguard all fish and wildlife resource” (Dyke et al. 2015). WS consulted the state Wildlife Action Plan (Dyke et al. 2015) as part of this analysis and the alternatives would be consistent with both plans.

1.5 AUTHORITY OF STATE AND FEDERAL AGENCIES

Below are brief discussions of the authorities of WS and other agencies, as those authorities relate to conducting wildlife damage management.

WS’ Legislative Authority

The primary statutory authority for the WS program is 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 when managing wildlife damage (see WS Directive 1.201, WS Directive 1.205, WS Directive 1.210).

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.

North Dakota Department of Agriculture

The Commissioner of the NDDA can cooperate and enter into agreements with WS for the control of wildlife that injure livestock or damage crops; the efforts to manage wildlife conflicts must be approved by the Director of the NDGFD (NDCC 4-01-17.1).

North Dakota Game and Fish Department

Except federally listed Threatened and Endangered (T&E) species, the NDGFD has management responsibility for resident species (NDCC 20.1-01-02), which include furbearers (NDCC 20.1-07), big game (NDCC 20.1-05); and birds (NDCC 20.1-04). The NDGFD is also authorized to cooperate with the NDDA and WS for the control of wildlife that injure livestock or damage crops (NDCC 4-01-17.1; NDCC 20.1-02-05). With the exception of black bears, the NDGFD allows landowners, tenants or that person’s agent to catch or kill wild furbearer animals that are depredating poultry, domestic animals, or crops without the need of permits (NDCC 20.1-07-04). The NDGFD can issue permits for the operation and use of private aircraft to assist with the management of wildlife damage (NDCC 20.1-02-05).

United States Forest Service and Bureau of Land Management

The United States Forest Service and the BLM have the responsibility to manage the resources on federal lands under their jurisdictions for multiple uses including livestock grazing, timber production, recreation, and wildlife habitat, while recognizing the authority of the NDGFD to manage resident wildlife populations. Both the United States Forest Service and the BLM recognize the importance of reducing wildlife damage on lands and resources under their jurisdictions, as integrated with their multiple use responsibilities. For these reasons, both agencies have entered into MOUs with WS nationally to facilitate a cooperative relationship.

1.6 COMPLIANCE WITH LAWS AND STATUTES

Several laws or statutes would authorize, regulate, or otherwise affect the activities of WS under the alternatives. WS would comply with applicable federal, state, and local laws and regulations in accordance with WS Directive 2.210. Below are brief discussions of those laws and regulations that would relate to damage management activities that WS could conduct in the State.

National Environmental Policy Act

All federal actions are subject to the NEPA (Public Law 9-190, 42 USC 4321 et seq.). WS follows the CEQ regulations implementing the NEPA (40 CFR 1500 et seq.) along with the USDA (7 CFR 1b) and the 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 that federal agencies must accomplish 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. In part, the CEQ, through regulations in 40 CFR, Parts 1500-1508, regulate federal activities that could affect the physical and biological environment. In accordance with regulations of the CEQ and the USDA, the APHIS has published guidelines concerning the implementation of the NEPA (see 44 FR 50381-50384).

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

Endangered Species Act

Under the Endangered Species Act (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 consultations with the USFWS pursuant to Section 7 of the ESA 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)). Evaluation of the alternatives in regards to the ESA will occur in Chapter 4 of this EA.

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 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 USFWS 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). Under the new regulations, WS may be required to apply for a non-purposeful take permit. This permit allows for any take that is associated with, but not the purpose of, an activity, when the take cannot practicably be avoided, and all advanced conservation practices have been implemented (see 50 CFR 22.26). As necessary, WS would apply for the appropriate permits as required by the Bald and Golden Eagle Protection Act.

Federal Insecticide, Fungicide, and Rodenticide Act

The FIFRA and its implementing regulations (Public Law 110-426, 7 USC 136 et. seq.) require the registration, classification, and regulation of all pesticides used in the United States. The EPA is responsible for implementing and enforcing the FIFRA. The EPA and the NDDA regulate pesticides that could be available to manage damage associated with predators.

National Historic Preservation Act of 1966, as amended

The National Historic Preservation Act (NHPA) and its implementing regulations (see 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 Section 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.

The Native American Graves Protection and Repatriation Act of 1990

The Native American Graves Protection and Repatriation Act (Public Law 101-106, 25 USC 3001) 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 agencies are to discontinue work until the agency has made a reasonable effort to protect the items and notify the proper authority.

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 animals that may cause safety and health concerns at workplaces.

Federal Food, Drug, and Cosmetic Act (21 USC 360)

This law places administration of pharmaceutical drugs, including those immobilizing drugs used for wildlife capture and handling, under the United States Food and Drug Administration.

Controlled Substances Act of 1970 (21 USC 821 et seq.)

This law requires an individual or agency to have a special registration number from the United States Drug Enforcement Administration to possess controlled substances, including controlled substances used for wildlife capture and handling.

Animal Medicinal Drug Use Clarification Act of 1994

The Animal Medicinal Drug Use Clarification Act and its implementing regulations (21 CFR 530) establish several requirements for the use of animal drugs, including those animal drugs used to capture and handle wildlife in damage management programs. Those requirements are: (1) a valid “*veterinarian-client-patient*” relationship, (2) well defined record keeping, (3) a withdrawal period for animals that have been administered drugs, and (4) identification of animals. A veterinarian, either on staff or on an advisory basis, would be involved in the oversight of the use of animal capture and handling drugs under any alternative where WS could use those immobilizing drugs and euthanasia chemicals. Veterinary authorities in each state have the discretion under this law to establish withdrawal times (*i.e.*, a period after a drug was administered that must lapse before an animal may be used for food) for specific drugs. Animals that people might consume within the withdrawal period must be identifiable (*e.g.*, use of ear tags) and labeled with appropriate warnings.

Airborne Hunting Act

The Airborne Hunting Act, passed in 1971 (Public Law 92-159), and amended in 1972 (Public Law 92-502) added to the Fish and Wildlife Act of 1956 as a new section (16 USC 742j-1) that prohibits shooting or attempting to shoot, harassing, capturing or killing any bird, fish, or other animal from aircraft except for certain specified reasons. Under exception [see 16 USC 742j-1, (b)(1)], state and federal agencies are allowed to protect or aid in the protection of land, water, wildlife, livestock, domesticated animals, human life, or crops using aircraft.

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

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

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

Children may suffer disproportionately for many reasons from environmental health and safety risks, including the development of their physical and mental status. Federal agencies must make it a high priority to identify and assess environmental health risks and safety risks that may disproportionately

affect children. In addition, federal agencies must ensure agency policies, programs, activities, and standards address disproportionate risks to children that result from environmental health risks or safety risks.

Invasive Species - Executive Order 13112

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

Depredating Furbearing Animals

Under NDCC 20.1-07-06, no person may “*take or attempt to take any fur-bearer outside a regularly prescribed season or without a license or as provided in section 20.1-07-04...*”. Under NDCC 20.1-07-04, “*a landowner or tenant or that person's agent may catch or kill any wild fur-bearing animal that is committing depredations upon that person's poultry, domestic animals, or crops...*”. Under NDCC 20.1-01-02, a furbearing animal “*...includes mink, muskrats, weasels, wolverines, otters, martens, fishers, kit or swift foxes, beavers, raccoons, badgers, wolves, coyotes, bobcats, lynx, mountain lions, black bears, and red or gray foxes*”.

Aircraft Hunting Permits

Under North Dakota Administrative Code (NDAC) 30-02-01-01, “*no person shall use an aircraft to hunt or harass any wildlife, or to knowingly participate in hunting or harassing any wildlife with an aircraft*”. However, under NDAC 30-02-01-02, “*A permit to use an aircraft in the hunting of predatory animals may be issued to any person, upon determination by the director of the [NDGFD] that such a permit is necessary for the protection of livestock, domesticated animals, wildlife, or human life, and that aircraft hunting is the preferred method of predatory animal control under the circumstances involved*”.

Cooperation between the NDGFD, the NDDA, and the APHIS

Under NDCC 4-01-17.1, the Commission of the NDDA may cooperate with and enter into agreements with the APHIS to manage damage associated with furbearers that are injurious to livestock, poultry, and big and small game. Similarly, under NDCC 20.1-02-05, the Director of the NDGFD may cooperate with the NDDA and other agencies to manage damage associated with predatory animals, including the use of aircraft to assist with managing damage.

1.7 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. The NDGFD is responsible for managing wildlife in the State of North Dakota. WS has consulted with and would continue to consult with the NDGFD to ensure an interdisciplinary approach according to the NEPA and agency mandates, policies, and regulations. WS would coordinate activities to reduce and/or prevent predator damage in the State that could occur under the alternatives with the NDGFD, which would ensure the NDGFD had the opportunity to incorporate any activities WS’ conducts into population objectives established for wildlife

populations in the State. In addition, the NDGFD establishes and regulates hunting and trapping seasons in the State.

Based on the scope of this EA, the decisions to be made are: 1) should WS conduct predator damage management to alleviate damage when requested; 2) should WS implement an integrated methods approach to meet the need for action; 3) if not, should WS attempt to implement one of the other alternative approaches; and 4) would continuing the current approach to managing damage or implementing the other alternative approaches result in effects to the environment requiring the preparation of an EIS.

CHAPTER 2: AFFECTED ENVIRONMENT AND ISSUES

Chapter 2 contains a discussion of the issues, including issues that will receive detailed environmental impact analysis in Chapter 4 (Environmental Consequences), issues that have driven the development of SOPs, and issues that WS and the NDGFD did not consider in detail, with rationale. Pertinent portions of the affected environment will be included in this chapter in the discussion of the issues. Additional descriptions of the affected environment occur during the discussion of the environmental effects in Chapter 4.

2.1 AFFECTED ENVIRONMENT

Those predator species addressed in this EA are capable of utilizing a variety of habitats in the State. Most species of predators addressed in this EA occur throughout the year across the State where suitable habitat exists for foraging and shelter. Damage or threats of damage caused by those predator species could occur statewide in North Dakota wherever those predators occur. However, under many of the alternative approaches discussed in Chapter 3, the WS program would only provide assistance when the appropriate landowner or manager requests such assistance and only on properties where WS and the entity requesting assistance signed a MOU, work initiation document, work plan, or another comparable document.

Upon receiving a request for assistance, WS could conduct activities to reduce predator damage or threats on federal, state, tribal, municipal, and private properties throughout North Dakota. Areas where damage or threats of damage could occur include, but would not be limited to agricultural fields, vineyards, orchards, farmyards, dairies, ranches, livestock operations, aquaculture facilities, fish hatcheries, grain mills, grain handling areas, railroad yards, waste handling facilities, industrial sites, natural resource areas, park lands, and historic sites; state and interstate highways and roads; railroads and their right-of-ways; property in or adjacent to subdivisions, businesses, and industrial parks; timberlands, croplands, and pastures; private and public property where burrowing predators cause damage to structures, dams, dikes, ditches, ponds, and levees; public and private properties in rural/urban/suburban areas where predators cause damage to landscaping and natural resources, property, and were a threat to human safety through the spread of disease. The area would also include airports and military airbases where predators were a threat to human safety and to property; areas where predators negatively affect wildlife, including T&E species; and public property where predators were negatively affecting historic structures, cultural landscapes, and natural resources. Chapter 4 also contains additional information on the affected environment.

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*” (see 40 CFR 1508.14). Therefore, when a federal action agency analyzes their potential

impacts on the “*human environment*”, it is reasonable for that agency to compare not only the effects of the proposed federal action, but also the potential impacts that occur or could occur in the absence of the federal action by a non-federal entity. This concept is applicable to situations involving federal assistance to reduce damage associated with animals.

In North Dakota, most predator species are under the management authority of the NDGFD without any federal oversight or protection. In some situations, with the possible exception of restrictions on methods (*e.g.*, firearms restrictions, pesticide regulations), unprotected predator species, such as skunks, and certain state-protected furbearers, are managed to allow anyone to lethally remove or take those species at any time when they are committing damage (see NDCC 20.1-07-04).

When a non-federal entity (*e.g.*, agricultural producers, municipalities, counties, private companies, individuals, or any other non-federal entity) takes an action to alleviate predator damage or threat of damage, the action is not subject to compliance with the NEPA due to the lack of federal involvement in the action. Under such circumstances, the environmental baseline or status quo would be an environment that includes those resources as other non-federal entities manage or affect those resources in the absence of the federal action. Therefore, in those situations in which a non-federal entity has decided that a management action directed towards predators should occur and even the particular methods that should be used, WS’ involvement in the action would not affect the environmental status quo since the entity could take the action in the absence of WS’ involvement. WS’ involvement would not change the environmental status quo if the requester had conducted the action in the absence of WS’ involvement in the action.

Most methods available for resolving damage associated with predators would also be available for use by other entities. Therefore, another entity besides WS could take the action at any time using many of the same methods that would be available for WS to use. For example, an entity experiencing damage could apply for a depredation permit from the NDGFD to remove those predators causing damage. Under certain circumstances, an entity experiencing damage could address furbearing animals without the need for a permit when damage is occurring to poultry, domestic animals, or crops (see Section 1.6). The NDGFD considers skunks to be an unprotected species, which allows residents of the State to remove skunks at any time without the need for a permit or license. In addition, people can harvest many of the predator species during annual hunting and trapping seasons; therefore, entities experiencing damage could alleviate damage by addressing those predators during the annual hunting and/or trapping season for those species. Under those circumstances, WS would have virtually no ability to affect the environmental status quo since the action would likely occur in the absence of WS’ direct involvement.

Therefore, based on the discussion above, it is clear that in those situations where a non-federal entity has already made the decision to remove or otherwise manage predators to stop damage with or without WS’ assistance, WS’ participation in carrying out the action would not affect the environmental status quo.

2.2 ISSUES ASSOCIATED WITH PREDATOR DAMAGE MANAGEMENT ACTIVITIES

Issues are concerns regarding potential effects that might occur from a proposed action. Federal agencies must consider such issues during the NEPA decision-making process. Initially, WS developed the issues related to managing damage associated with predators in cooperation with the NDGFD. In addition, WS and the NDGFD will invite the public to review and comment on the EA to identify additional issues.

Chapter 4 discusses the issues, as those issues relate to the possible implementation of the alternative approaches to meeting the need for action discussed in Chapter 1. WS evaluated, in detail, the following issues.

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

Maintaining viable populations of native species is a concern of the public and of biologists within the state and federal land and wildlife management agencies, including WS. Some authors and members of the public have expressed concern over unintentional ecological consequences from the predator damage management actions of WS (Bergstrom et al. 2014). Predators play a vital role in a healthy ecosystem; therefore, a common issue when addressing damage caused by wildlife is the potential impacts of the management actions on the populations of target predator species, including the potential effects of actions on the ability of people to harvest target predator species during the annual hunting and trapping seasons. Similarly, a concern often identified is the potential that activities would result in the loss of aesthetic benefits and non-consumptive uses (*e.g.*, wildlife watching, photographing) of target predators to the public, resource owners, or neighboring residents.

Under certain alternatives, WS could employ methods available to resolve damage and reduce threats to human safety that target an individual animal or a group of animals after applying the WS Decision Model (Slate et al. 1992) to identify possible techniques (see WS Directive 2.101, WS Directive 2.105, WS Directive 2.201, WS Directive 2.210). A common issue when addressing damage caused by wildlife are the potential impacts of management actions on the populations of target species and the potential effects on the ability of people to harvest target species during regulated seasons. Lethal and non-lethal methods would be available to resolve predator damage or threats to human safety. Non-lethal methods could disperse, translocate, or otherwise make an area unattractive to predators causing damage, which could reduce the presence of those predators at the site and potentially the immediate area around the site where an entity employed those methods. Employing lethal methods could remove a predatory animal or those predatory animals responsible for causing damage or posing threats to human safety. Therefore, the use of lethal methods could result in local population reductions in the area where damage or threats were occurring. The number of individual animals that WS' personnel could remove from a species' population using lethal methods would be dependent on the number of requests for assistance received, the number of individual animals involved with the associated damage or threat, the efficacy of methods employed, and the number of individuals the NDGFD authorizes WS to remove.

Another concern is that activities conducted by WS would affect the ability of persons to harvest predators either by reducing local populations through the lethal removal of predators or by reducing the number of predators present in an area through dispersal techniques. People in the State can harvest most of the predators addressed in this EA during annual hunting and/or trapping seasons. People can harvest badgers, bobcats, coyotes, fishers, red fox, long-tailed weasels, mink, mountain lions, raccoons, and striped skunks during annual hunting and/or trapping seasons. Badgers, coyotes, fox, raccoons, and striped skunks have no closed season, which allows people to harvest those species throughout the year. The only species addressed in this EA that do not have hunting and/or trapping seasons in the State are American marten, feral cats, and feral dogs.

Therefore, any damage management activities conducted by WS under the alternatives addressed would be occurring along with other natural process and human-induced events, such as natural mortality, human-induced mortality from private damage management activities, mortality from regulated harvest, and human-induced alterations of wildlife habitat. Chapter 4 of this EA discusses the effects on the populations of target predator populations in the State from implementation of the alternatives addressed in detail.

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

The issue of non-target species effects, including effects on T&E species, arises from the use of non-lethal and lethal methods available for use under each of the alternatives. Appendix B of this EA describes the

methods available for use under the alternatives. The use of non-lethal and lethal methods has the potential to inadvertently disperse, capture, or kill non-target animals. There are also concerns about the potential for adverse effects to occur to non-target animals from the use of chemical methods. Chemical methods that would be available for use to manage damage or threats associated with predators could include immobilizing drugs, euthanasia chemicals, sodium cyanide (coyotes, fox, feral dogs only)⁹, fumigants (coyotes, red fox, striped skunks only), and repellents. Chapter 4 and Appendix B further discuss those chemical methods available for use to manage damage and threats associated with predators in North Dakota. In addition, there are concerns regarding the potential effects of aircraft overflights on non-target wildlife from WS' use of aircraft. There may also be concerns that WS' activities could result in the capture or unintentional removal of eagles during WS' activities.

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

As part of the scoping process for this EA, WS consulted with the USFWS pursuant to Section 7 of the ESA to facilitate interagency cooperation between WS and the USFWS. Chapter 4 of this EA discusses the potential effects of the alternatives on this issue.

Issue 3 - Effects of Damage Management Methods on Human Safety

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

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 from exposure to the chemical from animals that have been exposed. Under the alternatives identified, the use or recommendation of chemical methods could include immobilizing drugs, euthanasia chemicals, sodium cyanide (coyotes, fox, feral dogs only), fumigants (coyotes, red fox, striped skunks only), and repellents. The EPA through the FIFRA and the NDDA through State laws would regulate pesticide use. The United States Drug Enforcement Administration and the United States Food and Drug Administration would regulate immobilizing drugs and euthanasia chemicals. In addition, the use of all chemical methods by WS would be subject to North Dakota laws and WS' directives (see WS Directive 2.401, WS Directive 2.405, WS Directive 2.415, WS Directive 2.425, WS Directive 2.430, WS Directive 2.455, WS Directive 2.465).

⁹Sodium cyanide in M-44 devices (EPA Reg #56228-15) can only be used to manage damage associated with coyotes, red fox, and feral dogs and only when those species are vectors of a communicable disease, when predation occurs on livestock and poultry, or when predation occurs on federally-designated threatened or endangered species.

Most methods available to alleviate damage and threats associated with predators would be non-chemical methods. Non-chemical methods may include cultural methods, limited habitat modification, animal behavior modification, and other mechanical methods. Changes in cultural methods could include improved animal husbandry practices, altering feeding schedules, changes in crop rotations, or conducting structural repairs. Limited habitat modification would be practices that alter specific characteristics of a localized area, such as removing bushes to eliminate shelter locations. Animal behavior modification methods would include those methods designed to disperse predators from an area through harassment or exclusion. Behavior modification methods could include pyrotechnics, propane cannons, barriers, electronic guards (Linhart et al. 1992), guard animals (Andelt 2004), effigies, and fladry (Mettler and Shivik 2007). Other mechanical methods could include cage traps, foothold traps, cable devices, shooting, or the recommendation that hunters and/or trappers reduce a local predator population during the annual hunting and/or trapping season.

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, pyrotechnics, or body-gripping traps. Most of the non-chemical methods available to address predator damage in North Dakota would be available for use under any of the alternatives and by any entity, when authorized. Chapter 4 further discusses the risks to human safety from the use of non-chemical methods as this issue relates to the alternatives. Appendix B provides a complete list of non-chemical methods available to alleviate damage associated with predators.

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

Additional concerns occur when inadequately addressing threats to human safety associated with aircraft striking predators at airports in the State. Predators have the potential to cause severe damage to aircraft, which can threaten the safety of passengers. Limiting or preventing the use of certain methods to address the potential for aircraft striking predators could lead to higher risks to passenger safety. Chapter 4 further evaluates those concerns in relationship to the alternatives.

Issue 4 – Humaneness and Animal Welfare Concerns of Methods

The issue of humaneness and animal welfare, as it relates to the killing or capturing of animals is an important but very complex concept that people can interpret in a variety of ways. The AVMA (2013) defines euthanasia as “...ending the life of an individual animal in a way that minimizes or eliminates pain and distress”. Some people would prefer using AVMA accepted methods of euthanasia when killing all animals, including wild and invasive animals. Schmidt (1989) indicated that vertebrate damage management for societal benefits could be compatible with animal welfare concerns, if “...the reduction of pain, suffering, and unnecessary death is incorporated in the decision making process.” Chapter 4 further discusses the issue of humaneness and animal welfare. Chapter 3 discusses SOPs intended to alleviate pain and suffering.

2.3 ISSUES CONSIDERED BUT NOT ANALYZED FOR EACH ALTERNATIVE

WS and the NDGFD identified additional issues during the scoping process of this EA. WS and the NDGFD considered those additional issues but a detailed analysis did not occur. Discussion of those additional issues and the reasons for not analyzing those issues in detail occur below.

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

The appropriateness of preparing an EA instead of an EIS was a concern WS and the NDGFD identified during the scoping process. Wildlife damage management falls within the category of actions in which the exact timing or location of individual activities can be difficult to predict well enough ahead of time to describe accurately such locations or times in an EA or even an EIS. Although WS and the NDGFD could predict some of the possible locations or types of situations and sites where some kinds of wildlife damage would occur, the program cannot predict the specific locations or times at which affected resource owners would determine a damage problem had 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 animal populations over broad areas at a much more intensive level than would be desired by most people, including WS, the NDGFD, 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 the APHIS procedures implementing the NEPA, WS' individual wildlife damage management actions could be categorically excluded (see 7 CFR 372.5(c)). The intent in developing this EA has been to determine if the alternative approaches developed to meet the need for action could potentially have significant individual and/or cumulative impacts on the quality of the human environment that would warrant the preparation of an EIS. This EA addresses impacts for managing damage and threats to human safety associated with predators 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 WS made a determination through this EA that the alternatives could have a significant impact on the quality of the human environment, then WS would publish a notice of intent to prepare an EIS and this EA would be the foundation for developing the EIS. Based on previous requests for assistance, the WS program in North Dakota would continue to conduct predator damage management on a small percentage of the land area in the State where damage was occurring or likely to occur.

A Site Specific Analysis Should be made for Every Location Where Predator Damage Management Would Occur

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

The issues raised during the scoping process of this EA drove the analysis. In addition to the analysis contained in this EA, WS' personnel use the WS Decision Model (Slate et al. 1992; see WS Directive 2.201) described in Chapter 3 as a site-specific tool to develop the most appropriate strategy at each

location. The WS Decision Model is an analytical thought process that WS' personnel would use to evaluate and respond to requests for assistance. As discussed previously, one EA analyzing impacts for the entire State would provide a more comprehensive and less redundant analysis that allows for a better cumulative impact analysis. If a determination were made through this EA that the alternatives developed to meet the need for action could result in a significant impact on the quality of the human environment, then an EIS would be prepared.

Concerns that Killing Wildlife Represents “Irreparable Harm”

Public comments have raised the concern that the killing of any wildlife represents irreparable harm. Although the WS program may lethally remove an individual predator or multiple predators in a specific area under some of the alternatives to alleviate damage or threats of damage, the lethal removal of an individual predator or multiple predators in a localized area would not likely represent irreparable harm to the continued existence of a species. Wildlife populations experience mortality from a variety of causes, including human harvest and damage management activities (see Section 4.2). The WS program would conduct damage management activities associated with predators only at the request of a cooperator to reduce damage that was occurring or to prevent damage from occurring. The WS program would monitor activities to ensure the program identified and addressed any potential impacts. WS would work closely with resource agencies to ensure damage management activities would not adversely affect predator populations and that activities conducted by WS were considered as part of management goals established by those agencies. Chapter 4 addresses the environmental consequences that each alternative could have on target predator populations.

Alternatives May Be “Highly Controversial” and the Effects May Be “Highly Uncertain”

The failure of any particular special interest group to agree with every act of a federal agency does not create a controversy, and the NEPA does not require the courts to resolve disagreements among various scientists as to the methodology used by an agency to carry out its mission (*Marsh vs. Oregon Natural Resource Council*, 490 USC 360, 378 (1989)). Section 4.1 of this EA analyzes the environmental consequences of each alternative in comparison to determine the extent of actual or potential impacts on the issues. If WS made a determination through this EA that the effects were highly uncertain, then the WS would publish a notice of intent to prepare an EIS and this EA would be the foundation for developing the EIS.

Predator Damage Management Should Not Occur at Taxpayer Expense

An issue identified is the concern that WS should not provide assistance at the expense of the taxpayer or that activities should be fee-based. Funding for WS' activities could occur from federal appropriations, through state funding, and through cooperative funding. Funding for WS' activities could occur through cooperative service agreements with individual property owners or managers. Federal, state, and local officials have made the decision to provide funding for damage management activities and have allocated funds for such activities. Additionally, damage management activities are an appropriate sphere of activity for government programs, since managing wildlife is a government responsibility. Treves and Naughton-Treves (2005) and the International Association of Fish and Wildlife Agencies (2005) discuss the need for wildlife damage management and that an accountable government agency is best suited to take the lead in such activities because it increases the tolerance for wildlife by those people being impacted by their damage and has the least impacts on wildlife overall.

Livestock Losses Are a Tax “Write Off”

Some people believe that livestock producers receive double benefits because producers could receive assistance from WS to resolve predation on livestock while they also receive deductions for livestock lost as a business expense on tax returns. However, this notion is incorrect because the Internal Revenue Service tax code (Internal Revenue Code, Section 1245, 1281) does not allow livestock losses to be “written off” if the killed livestock was produced on their property. Most predation occurs on young livestock (e.g., lambs, kids, and calves) in North Dakota. Additionally, livestock producers add many ewes, nannies, and cows as breeding stock replacements to herds from the lamb, kid, and calf crop, and if lost to predation they cannot be “written off” since the livestock producer did not purchase those animals. Those factors limit the ability of livestock producers to recover financial losses.

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 alternative approaches that WS and the NDGFD are considering. However, the methods determined to be most effective to reduce damage and threats to human safety caused by predators and that prove to be the most cost effective would likely receive the greatest application. As part of an integrated approach and as part of the WS Decision Model, evaluation of methods would continually occur to allow for those methods that were most effective at resolving damage or threats to be employed under similar circumstance where predators were causing damage or posing a threat. Additionally, management operations may be constrained by cooperater funding and/or objectives and needs. Therefore, the cost of methods can often influence the availability of methods to resolve damage, which can influence the effectiveness of methods.

Effectiveness of Predator Damage Management Methods

Defining the effectiveness of any damage management activities often occurs in terms of losses or risks potentially reduced or prevented. Effectiveness can also be dependent upon how accurately practitioners diagnose the problem, the species responsible for the damage, and how people implement actions to correct or mitigate risks or damages. To determine that effectiveness, WS must be able to complete management actions expeditiously to minimize harm to non-target animals and the environment, while at the same time, using methods as humanely as possible. The most effective approach to resolving any wildlife damage problem would be to use an adaptive integrated approach, which may call for the use of several management methods simultaneously or sequentially.

The purpose behind integrated management is to implement methods in the most effective manner while minimizing the potentially harmful effects on people, target and non-target species, and the environment¹⁰. Efficacy is based on the types of methods employed, the application of the method, restrictions on the use of the method(s), the skill of the personnel using the method and, for WS’ personnel, the guidance provided by WS’ directives and policies.

The goal would be to reduce damage, risks, and conflicts with wildlife as requested and not to reduce/eliminate populations. Localized population reduction could be short-term with new individuals immigrating into the area or born to animals remaining at the site. The ability of an animal population to sustain a certain level of removal and to return to pre-management levels eventually does not mean individual management actions were unsuccessful, but that periodic management may be necessary. The

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

return of wildlife to pre-management levels also demonstrates that limited, localized damage management methods have minimal impacts on species' populations.

The WS program in North Dakota often receives comments that lethal methods would be ineffective because additional predators would likely return to the area. In addition, comments also claim that because predators return to an area after initial removal efforts were complete, the use of lethal methods gives the impression of creating a financial incentive to continue the use of only lethal methods. Those statements assume predators only return to an area where damage was occurring if the WS program or other entities used lethal methods. However, the use of non-lethal methods would also often be temporary, which could result in predators returning to an area where damage was occurring once WS or other entities no longer used those methods. The common factor when employing any method would be that predators would return if suitable conditions continued to exist at the location where damage was occurring and predator densities were sufficient to occupy all available habitats to the extent that damage occurs. Therefore, any reduction or prevention of damage from the use of methods addressed in Appendix B would be temporary if conditions continue to exist that attract predators to an area where damage was occurring.

Dispersing predators using non-lethal methods addressed in Appendix B often requires repeated application to discourage those animals from returning to locations, which increases costs, moves animals to other areas where they could cause damage, and would be temporary if habitat conditions that attracted those predators to damage areas remained unchanged. Some people could view dispersing and translocating predators as moving a problem from one area to another, which would require addressing damage caused by those predators at another location. Therefore, dispersing and translocating predators could increase costs and could be perceived as creating a financial incentive to continue the use of those methods since predators would have to be addressed annually and at multiple locations. WS' recommendation of or use of techniques to modify existing habitat or making areas unattractive to predators is discussed in Appendix B. The objective of the WS program would be to respond to requests for assistance with the most effective methods and to provide for the long-term solution to the problem using WS' Decision Model.

Managing damage caused by predators can be divided into short-term redistribution approaches and long-term population and habitat management approaches. Short-term approaches focus on redistribution and dispersal of predators to limit use of an area where damage or threats were occurring. Short-term redistribution approaches may include prohibiting feeding, the use of pyrotechnics, propane cannons, effigies, and other adverse noise, erecting access barriers, such as fencing, and repellents. Population reduction by limiting survival or reproduction and habitat modification would be considered long-term solutions to managing damage caused by wildlife.

Redistribution methods would often be employed to provide immediate resolution to damage occurring until long-term approaches can be implemented or have had time to reach the desired result. Dispersing predators can often be a short-term solution that moves those predators to other areas where damages or threats could occur. Some short-term methods may become less effective in resolving damage as a predator population increases, as predators become more acclimated to human activity, and as predators become habituated to harassment techniques. Non-lethal methods often require a constant presence at locations when predators were present and must be repeated every day or night until the desired results are achieved, which can increase the costs associated with those activities. Non-lethal methods may also require constant monitoring and maintenance to insure proper results. For example, fencing could be used to prevent access to a resource; however, constant monitoring of the fencing would be required and necessary repairs completed to ensure the use of fencing would be successful in preventing access to resources. Long-term solutions to resolving predator damage often require management of the population and identifying the habitat characteristics that attract predators to a particular location.

Research has shown that in areas without some level of damage management, losses of adult sheep and lambs to predators can be as high as 8.4% and 29.3% of the total number of sheep, respectively (Henne 1975, Munoz 1977, O’Gara et al. 1983). Additional research has indicated that sheep and lamb losses are generally lower where predator damage management was applied (Nass 1977, Tigner and Larson 1977, Howard and Shaw 1978, Howard and Booth 1981). The effectiveness of damage management activities can also be measured by public satisfaction.

Shwiff and Merrell (2004) reported a 5.4% increase in the numbers of calves brought to market when coyotes were removed by aerial operations. Bodenchuk et al. (2002) reported benefit-cost ratios of 3:1 to 27:1 for agricultural resource protection from predators. Wagner and Conover (1999) found that total lamb losses declined 25% on grazing allotments in which coyotes were removed by winter aerial operations five to six months ahead of summer sheep grazing. On allotments where no aerial operations occurred, total lamb losses only declined 6%. Confirmed losses to coyotes declined by 7% on allotments where aerial operation occurred, but increased 35% on allotments where no aerial operations occurred (Wagner and Conover 1999).

Based on an evaluation of the damage situation using the WS Decision Model, the most effective methods could be employed individually or in combination based on prior evaluations of methods or combinations of methods in other damage management situations. Once employed, methods could be further evaluated for effectiveness based on a continuous evaluation of activities by the WS program. Therefore, the effectiveness of methods would be considered as part of the decision making-process under the use of the Decision Model described in Chapter 3 for each damage management request based on the continual evaluation of methods and results.

Livestock Losses are Low When Compared to Losses from Other Sources and Other Factors

As shown in reports published by the NASS and other agencies (*e.g.*, see NASS 2010, NASS 2011, APHIS Veterinary Services 2012, APHIS Veterinary Services 2015), livestock losses do occur from predators but can also occur from disease, weather, injury, birthing, poisoning, and theft. In most cases, livestock losses to non-predator causes are higher than losses attributed to predators. For example, during 2014, the percentage of the lamb crop lost to non-predator causes was 9.0% in North Dakota. In comparison, the percentage of the lamb crop lost in the State from predators was 3.7% during 2014 (APHIS Veterinary Services 2015). Therefore, people express concern that WS should not provide any assistance or should limit assistance to certain methods (*e.g.*, non-lethal only methods) when livestock losses are low compared to the losses from other sources.

As discussed in Section 1.2, predators are responsible for preying upon a wide variety of livestock, including cattle, sheep, goats, swine, exotic pen-raised game, other hoofed-stock, and poultry. Livestock losses due to predation can cause economic hardships to farmers and ranchers, and without effective ways to reduce predation rates, economic losses from predation can increase (Nass 1977, Howard and Shaw 1978, Nass 1980, Howard and Booth 1981, O’Gara et al. 1983, Bodenchuk et al. 2002). Not all producers suffer losses to predators; however, for those producers that do suffer livestock losses caused by predators, those losses can be economically burdensome (Baker et al. 2008).

The WS program in North Dakota, along with other entities, has conducted activities to manage damage caused by predators in the State for many years. Therefore, livestock losses in North Dakota reported by the NASS and other entities are the losses that occur with WS, and other entities, providing assistance with managing predator damage in the State. Thus, the WS program expects livestock losses to be low in the State due to ongoing activities to manage damage. Furthermore, livestock producers generally do not wait for losses to become economically burdensome before conducting damage management activities

and/or requesting assistance from WS or other entities. Therefore, livestock producers often attempt to act before such losses become unacceptable. In areas without some level of managing predator damage, losses of adult sheep and lambs can be as high as 8.4% and 29.3%, respectively (Henne 1975, Munoz 1977, O’Gara et al. 1983). Sheep and lamb losses can be lower where people conduct activities to manage predator damage (Nass 1977, Tigner and Larson 1977, Howard and Shaw 1978, Howard and Booth 1981). In addition, while the livestock losses across an entire state in any one year may not represent a large percent of the state’s total livestock revenues, livestock losses due to predators can be site-specific and can be economically burdensome for an individual producer.

Section 1.2 discusses the need for action, including the need to manage damage to livestock associated with predators. Based on the information presented in Section 1.2 and for those reasons discussed in this section, the WS program in North Dakota believes there is a sufficient need to manage the damage that predators can cause to livestock in the State. Section 3.1 and Section 3.2 discuss the alternative approaches that WS identified to manage predator damage in the State, including damage to livestock.

Perceived Threats of Loss Are Not Sufficient to Trigger the Need to Manage Predator Damage

Some people express a concern that individual perceptions of risk from predators could be disproportionately high to actual risk, which could potentially result in a request to have a predator lethally removed just because someone saw the animal near their neighborhood, their business, or their animals. The primary concern is that WS may initiate activities in response to a perceived but unsubstantiated threat from a requester and that perceived threats of loss are not sufficient to trigger the need to manage predator damage.

Section 1.2 addresses the need for action associated with predators in the State, including the threats that predators can pose. For example, as discussed in Section 1.2, aircraft have struck predators in the State, which can cause damage to aircraft and threaten the safety of passengers. Therefore, threats to human safety would likely warrant conducting activities to prevent aircraft from striking predators. Similarly, the spread of diseases or potential attacks on people or pets could warrant activities occurring before a disease outbreak occurs or before a predator seriously injures a person or pet.

As discussed in Section 1.2, a positive correlation between predator concentrations and livestock losses due to predation often exists (Shelton and Klindt 1974, Pearson and Caroline 1981, Nunley 1995, Stoddart et al. 2001). For example, Shelton and Klindt (1974) documented a correlation between coyote densities and levels of sheep loss in Texas, and Robel et al. (1981) found a similar correlation in Kansas. Therefore, when predator concentrations increase, predation loss can be a factor in livestock production; thus, lowering predator densities can reduce predation risks. For example, Gantz (1990) concluded that late winter removal of territorial coyotes from mountain grazing allotments could reduce predation on sheep grazing on those allotments the following summer. Wagner and Conover (1999) found that the percentage of lambs lost to coyote predation declined from 2.8% to less than 1% on grazing allotments in which removal of coyotes occurred three to six months before summer sheep grazing.

The rationale for conducting preventive damage management to reduce damage differs little in principle from holding controlled hunts for deer in certain areas where agricultural damage has been a historic problem. By reducing the number of deer near agricultural fields, or the number of coyotes near a flock of sheep, an entity can reduce the likelihood of damage.

Based on the information presented in Section 1.2 and for those reasons discussed in this section, the WS program in North Dakota believes there is a sufficient need to manage the threat of damage that predators can pose when WS’ personnel use the WS Decision Model to determine that conducting activities to manage those threats would be appropriate. The WS Decision Model (see WS Directive 2.201) described

by Slate et al. (1992) depicts how WS' personnel would use a thought process for evaluating and responding to requests for assistance when implementing the applicable alternative approaches discussed in Section 3.1. If an assistance request were within the authority of WS, WS' employees would gather and analyze damage information to determine applicable factors, such as what species was responsible for the damage, the type of damage, the extent of damage, and the magnitude of damage. Other factors that WS' employees could gather and analyze would include the current economic loss or current threat (*e.g.*, threat to human safety), the potential for future losses or damage, the local history of damage, and what management methods, if any, were used to reduce past damage and the results of those actions. In addition, under several alternative approaches identified in Section 3.1, WS' personnel could provide technical assistance (*e.g.*, advice, training, educational materials) to individuals and communities so they have the information needed to better understand the role and potential impacts of animals in their area.

Rancher Responsibility to Protect their Livestock through Use of Husbandry Methods

As discussed in Section 1.2 and elsewhere in the EA, livestock producers in North Dakota do implement many non-lethal methods to prevent livestock predation. The primary non-lethal method employed by cattle producers in North Dakota was the use of guard animals. WS was instrumental in the introduction and adoption of livestock guarding dogs in the late 1980s and early 1990s and continues to recommend use of livestock guarding dogs where appropriate (Green and Woodruff 1983, Green and Woodruff 1988). The NWRC continues to conduct research into new breeds of livestock guarding dogs (Marlow 2016). Producers also reported using additional non-lethal methods, including culling, frequent checks, livestock carcass removal, exclusion fencing, fright tactics, herding, and night penning (NASS 2011). Sheep producers in the State use many of the same non-lethal methods, with guard animals being a primary method (APHIS Veterinary Services 2015).

Some non-lethal methods available to alleviate damage or threats associated with predators are impractical for implementation by WS' personnel, such as altering livestock management practices (*e.g.*, night-penning, herding, carcass removal) and physical exclusion (*e.g.*, predator-proof fencing). Therefore, implementation of most non-lethal methods for livestock protection falls within the purview of the livestock producer (Knowlton et al. 1999). Those persons experiencing damage often employ non-lethal methods to reduce damage or threats prior to contacting the WS program. Many of those non-lethal methods (*e.g.*, fencing and guard animals) require a large investment in time to implement and have a high initial cost (Mitchell et al. 2004). Even with the additional effort and costs, those methods are not always effective at reducing damage and potentially have side effects (*e.g.*, concentrating livestock can cause unwanted damage to particular pasture areas) (Knowlton et al. 1999).

If WS implemented several of the alternative approaches discussed in Section 3.1, WS' personnel would use the WS Decision Model to evaluate and respond to requests for assistance, which would include assessing what management methods, if any, the requester was using to reduce damage and the results of those actions. Based on that assessment, WS could recommend or implement non-lethal methods to alleviate damage if WS implements several of the alternative approaches discussed in Section 3.1. In addition, pursuant to WS Directive 2.101, WS' personnel would give preference to non-lethal methods when they determine those methods to be practical and effective for the damage situation.

Impacts of WS' Activities on the Use of Public Areas by People

The use of public areas by people can encompass a wide variety of outdoor activities in the form of consumptive and non-consumptive uses and provides aesthetic benefits to the individuals who participate in the activities. In addition, those activities can contribute the economy in North Dakota. Examples of consumptive uses of public lands include hunting and fishing. Examples of non-consumptive uses include bird watching, photography, camping, hiking, and biking.

The State of North Dakota encompasses approximately 44.2 million acres of land (United States Census Bureau 2010). In North Dakota, there are approximately 1.7 million acres of federal property (Vincent et al. 2014). However, not all of the federal property in the State is open to public access. The NDGFD manages more than 200,000 acres in the State for wildlife habitat and public hunting (NDGFD 2016a). In addition, the North Dakota Department of Trust Lands has administrative authority over approximately 707,000 acres of state trust land that is generally open to public access unless otherwise limited by the entity leasing the land (North Dakota Department of Trust Lands 2015). In total, less than 6% of the land area within the State is public land. In addition, not all of the public land is open to public access.

If the WS program in North Dakota conducts activities on public lands, some people occasionally express concerns that WS' activities would limit their ability to use those areas or would increase threats to the safety of people and pets from the potential exposure of the public to methods that WS could use on those lands. The potential risks to human health and safety associated with WS' use of the methods discussed in Appendix B is a concern that WS identifies in Section 2.2 and evaluates in comparison amongst the alternatives in Section 4.1. Similarly, Section 2.2 and Section 4.1 address the potential effects from WS' activities on the public's aesthetic enjoyment of animals and the potential effects of WS' activities on recreational activities (*e.g.*, hunting, wildlife watching, hiking).

As discussed further in Section 3.1, the WS program would only conduct activities when the appropriate landowner or manager requests such assistance and only after the landowner or manager signs a MOU, work initiation document, work plan, or a similar document allowing WS to conduct activities. On public lands, the WS program in North Dakota would coordinate with the land management agency to determine high public use areas, which could include the use of areas during particular times of the year, such as during a hunting season. In most cases, WS avoids conducting activities in high use recreational areas on public lands. An exception could be a situation where WS receives a request to assist with threats to human health and safety in those areas. In addition, WS' personnel and/or the management agency would likely limit the types of equipment that WS would use in those areas. For example, the WS program in North Dakota could coordinate with land management agencies by developing a work plan. As part of the work plan, the land management agency could designate different work zones on maps that they provide to WS. If the land management agency designated a particular work zone as a high use recreational area, the agency could limit the use of certain methods to a quarter of a mile of those areas. In another example, if a particular area is a high use area during certain times of the year, such as during a hunting season, the work plan could require the removal of all methods from those areas during the duration of the hunting season. Therefore, the land management agency and WS can identify high use recreational areas in work plans and on maps so WS' activities do not interfere with recreational activities unless necessary (*e.g.*, to protect human health and safety).

In addition, public land management agencies do not generally close public land areas while WS' personnel conduct activities or because of WS' activities, except in extreme cases where threats to human health or safety was a concern. For example, if a predator attacked a visitor, the land management agency could close an area where the attack occurred to reduce risks to other visitors until WS was able to capture or remove the responsible animal. In those cases, the land management agency would likely restrict access to an area because of the threat to human safety associated with an animal or animals and not because of specific activities that WS would conduct. In those situations, the land management agency would likely close the area in the absence of any involvement by WS.

Therefore, the activities of WS are not likely to limit or restrict access to public lands within the State. A land management agency would determine what, if any, restrictions would occur on lands they own or manage. Coordination of WS' activities with the land management agency would ensure restrictions or access limitations were not necessary by avoiding high use areas. Section 4.1 of this EA evaluates the

potential threats to human health and safety associated with the alternative approaches to managing predator damage in the State. Similarly, Section 4.1 addresses the potential effects from WS' activities on the public's aesthetic enjoyment of animals and the potential effects of WS' activities on recreational activities.

Impacts on Cultural, Archaeological, and Historic Resources, and Tribal Cultural Properties

The methods described in this EA that WS could use to manage predator damage do not cause major ground disturbance, do not cause any physical destruction or damage to property, do not cause any alterations of property, wildlife habitat, or landscapes, and do not involve the sale, lease, or transfer of ownership of any property. In general, the use of such methods also do not have the potential to introduce visual, atmospheric, or audible elements to areas that could result in effects on the character or use of historic properties. Therefore, the methods that would be available under the alternatives would not generally be the types of methods that would have the potential to affect historic properties. If WS planned an individual activity with the potential to affect historic resources under an alternative selected because of a decision on this EA, WS would conduct the site-specific consultation, as required by Section 106 of the NHPA, as necessary.

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

In addition, the WS program in North Dakota would only conduct activities on tribal lands at the request of the tribe and only after signing appropriate authorizing documents. Therefore, the Tribe would determine what activities they would allow and when WS' assistance was required. 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 likely occur.

Effects of Activities on Unique Characteristics of Geographic Areas

A number of different types of federal and state lands occur within the analysis area, such as national wildlife refuges, waterfowl production areas, wildlife management areas, and national grasslands. WS recognizes that some persons interested in those areas may feel that any activities would adversely affect the aesthetic value and natural qualities of the area. WS would abide by federal and state laws, regulations, work plans, MOUs, and policies to minimize any effect on the public and would abide by any restrictions imposed by the land management agency on activities conducted by WS.

Cumulative Effects on Wildlife Populations from Oil and Gas Development, Timber Harvesting, Land Development, and Grazing

A concern identified is the potential effects of damage management activities on wildlife species when considering past, present, and future effects from other activities, such as oil and gas development, timber harvesting, other land development actions, such as residential subdivision development, and grazing. WS has no authority to affect decisions of other entities that engage in or approve such actions. Thus, the

decisions made by other entities do not relate or connect to activities that WS could conduct. The effects of such actions by other agencies and entities are part of the existing *environmental status quo* and would neither increase nor decrease because of activities that could be conducted by WS.

The following discussion is provided to give an example of what potential, if any, damage management activities conducted by WS could contribute to cumulative effects on wildlife species in North Dakota and the environment that have resulted from oil and gas development, timber harvest, land development, and grazing (*i.e.*, the environmental baseline).

Adverse effects on some wildlife could result from land management and development activities. Housing developments in rural areas can potentially have adverse effects on wildlife by diminishing habitat (Gill 1999). Oil and gas development can adversely affect certain wildlife species by reducing the amount of available habitat. Road building and establishment of well pads (sites where wells are drilled to pump oil or gas out of the ground) reduce habitat directly by removing vegetation that animals use for food and cover. Timber harvest can benefit some wildlife species while negatively affecting others (United States Forest Service 1998). For example, deer generally benefit from the creation of openings in large expanses of mature forest. Roads established to support oil and gas development and timber harvest further indirectly reduce the amount of habitat effectively available to certain species because many of those species fear using areas where humans are traveling, which is considered a displacement effect caused by roads.

Dyke et al. (2011) identified the potential impacts associated with oil and gas development on the wildlife resources in the State (including individuals that utilize those resources), provided an assessment of the cumulative effects energy development on a broad range of wildlife species, and defined possible measures to offset impacts of energy development. McEnroe and Sapa (2011) stated, “*With comprehensive planning and review of oil and gas development, many of the environmental and agricultural impacts can be avoided or minimized. For those that cannot, mitigation measures can be developed and must be implemented to assure that the state’s wildlife and natural resources are maintained for the benefit of our citizens.*”

If the WS program selected an alternative approach to meeting the need for action that allows the program in North Dakota to provide assistance (see Section 3.1), WS would monitor activities, in context of the issues analyzed in detail, to determine if the need for action and the associated impacts remain within the parameters established and analyzed in this EA. Pursuant to SOPs discussed in Section 3.3 and Section 3.4, WS would continue to coordinate activities to reduce and/or prevent predator damage in the State with the NDGFD. The NDGFD is responsible for managing wildlife populations in the State and their habitats. Therefore, coordinating activities would ensure the NDGFD had the opportunity to incorporate any activities WS’ conducts into population objectives established for wildlife populations in the State. As part of those coordinated activities, WS would submit annual activity reports to the NDGFD to aid with the ongoing monitoring efforts of the NDGFD. If WS and the NDGFD determined that new needs for action, changed conditions, new issues, or new alternatives having different environmental impacts must be analyzed, WS and the NDGFD would supplement this analysis or conduct a separate evaluation pursuant to the NEPA. Through monitoring, WS and the NDGFD can evaluate and adjust activities as changes occur over time.

WS’ monitoring would also include reviewing the list of species the USFWS considers as threatened or endangered within the State pursuant to the ESA. As appropriate, WS would consult with the USFWS pursuant to Section 7 of the ESA to ensure the activities conducted by WS would not jeopardize the continued existence of threatened or endangered species or result in adverse modification to areas designated as critical habitat for a species within the State. Through the review of species listed as threatened or endangered and the consultation process with the USFWS, the WS program in North

Dakota can evaluate and adjust activities conducted pursuant to any alternative approach selected to meet the need for action. Accordingly, WS and the NDGFD could supplement this analysis or conduct a separate evaluation pursuant to the NEPA based on the review and consultation process. In this way, any actions conducted by WS would be responsive to ongoing changes and the associated cumulative impacts of actions conducted in North Dakota in accordance with the NEPA.

Effects of Livestock Grazing on Riparian Areas and Wildlife Habitat as a Connected Action to Damage Management Activities

Based on other scoping process, some members of the public have expressed that livestock grazing is a connected action to damage management activities. However, a connected action implies that grazing is an interdependent part of damage management activities that depends on such activities for its justification, that it is automatically triggered by damage management activities, or that grazing cannot and will not proceed unless damage management occurs (40 CFR 1508.25).

Livestock grazing in North Dakota occurs on private property at the discretion of the property owner without involvement from WS or any activities conducted by WS. Therefore, livestock grazing is not automatically triggered by damage management activities conducted by WS, and it clearly can and does proceed in the absence of damage management assistance provided by WS.

Some public commenters have asserted that damage management activities to protect livestock cannot or would not proceed unless livestock grazing was occurring. If no livestock production occurred, there would be no need to protect livestock from predation and there would be no reason for WS to conduct damage management for livestock protection if there were no livestock. Conversely, there would be no damage management actions to protect livestock if there were no predators. Damage management activities associated with predators could and do occur by other entities in North Dakota, whether WS provides such assistance or not. Since federal agencies do not have the authority to regulate private land livestock grazing, such grazing and its effects are part of the existing human environment (*i.e.*, environmental status quo) and such private land livestock grazing is quite common and extensive.

As long as livestock producers experience economic losses from predators, activities to prevent or reduce further losses would continue to occur whether assistance was provided by WS or not. In the absence of any involvement by WS, livestock owners and managers or authorized state agencies would continue to conduct damage management activities on their own. Even if some livestock producers went out of business due to economically severe predation in the absence of any assistance that does not mean livestock grazing would not continue. Some of those producers would be expected to sell their properties to other producers that may have a better economic ability to withstand predation losses.

Livestock grazing and its impacts on the environment and damage management activities conducted by non-federal entities does not have to comply with the requirements and provisions of the NEPA and would represent the environmental status quo for the human environment. Damage management activities by private or non-federal entities would not be governed or restricted by the environmental laws that govern federal agencies, such as the NEPA and the consultation requirements of Section 7 of the ESA. The only livestock grazing activities that are subject to the requirements of the NEPA would be those that were authorized by federal land management agencies to occur on federal lands, such as the BLM or United States Forest Service. Those federal agencies would prepare documents pursuant to the NEPA covering their authorization of livestock grazing on federal public lands and the potential environmental effects of livestock grazing.

Effects of Activities on Soils, Water, and Air Quality

The implementation of those alternative approaches discussed in Section 3.1 by WS would meet the requirements of applicable federal laws, regulations, and Executive Orders for the protection of the environment, including the Clean Air Act and Executive Order 13514¹¹. The actions discussed in this EA do not involve major ground disturbance, construction, or habitat alteration. Chapter 3 discusses the SOPs to reduce risks to the environment that WS would incorporate into activities when implementing applicable alternative approaches to managing damage. Activities that WS could implement pursuant to those applicable alternative approaches discussed in Section 3.1 would not occur in aquatic systems or cause changes in the flow, quantity, or storage of water resources. WS' personnel would use, store, and dispose of all chemical methods in accordance with applicable laws and regulations pursuant to WS Directive 2.210. The use, storage, and disposal of chemical methods by WS' personnel would also follow WS' directives, including WS Directive 2.401, WS Directive 2.405, WS Directive 2.415, WS Directive 2.430, WS Directive 2.455, and WS Directive 2.465.

WS' personnel would follow EPA-approved label directions for all pesticide use (see WS Directive 2.401). The intent of the registration process for chemical pesticides is to assure minimal adverse effects occur to the environment when people use the chemicals in accordance with label directions. For example, the EPA (2009) determined there was no risk of exposure through soil or surface water when following the label restrictions for sodium cyanide in the M-44 device. The WS program in North Dakota would properly dispose of any excess solid or hazardous waste in accordance with applicable federal, tribal, state, and local regulations.

Aerial wildlife operations, like any other flying, may result in an accident. WS' pilots and crewmembers would receive training and would have experience to recognize the circumstances that lead to accidents. The national WS Aviation Program has increased its emphasis on safety, including funding for additional training, the establishment of a WS Flight Training Center, and annual recurring training for all pilots. However, accidents may still occur. Nationwide, the WS program has been using aircraft during aerial operations for many years. During this time, no incidents of major ground fires associated with WS' aircraft accidents have occurred.

Aviation fuel is extremely volatile and it will normally evaporate within a few hours or less to the point that even detecting its odor is difficult. The fuel capacity for aircraft used by WS varies. For fixed-winged aircraft, a 52-gallon capacity would generally be the maximum, while 91 gallons would generally be the maximum fuel capacity for helicopters. In some cases, little or none of the fuel would spill if an accident occurs. Thus, there should be little environmental hazard from unignited fuel spills.

With the size of aircraft used by WS, the quantities of oil (*e.g.*, 6 to 8 quarts maximum for reciprocating (piston) engines and 3 to 5 quarts for turbine engines) capable of spilling in any accident would be small with minimal chance of causing environmental damage. Aircraft used by WS would be single engine models, so the greatest amount of oil that could spill in one accident would be about eight quarts.

Petroleum products degrade through volatilization and bacterial action, particularly when exposed to oxygen (EPA 2000). Thus, small quantity oil spills on surface soils can biodegrade readily. Even in subsurface contamination situations involving underground storage facilities that generally involve larger quantities than would ever be involved in a small aircraft accident, the EPA guidelines provide for

¹¹Executive Order 13514 mandates that at least 15 percent of existing federal buildings and leases meet Energy Efficiency Guiding Principles by 2015, and that annual progress be made toward 100 percent conformance of all federal buildings, with a goal of 100% of all new federal buildings achieving zero-net-energy by 2030. "Zero-net-energy building" is defined in Executive Order 13514 as "a building that is designed, constructed, and operated to require a greatly reduced quantity of energy to operate, meet the balance of energy needs from sources of energy that do not produce greenhouse gases, and therefore result in no net emissions of greenhouse gases and be economically viable".

“*natural attenuation*” or volatilization and biodegradation in some situations to mitigate environmental hazards (EPA 2000). Thus, even where the owner of the aircraft did not clean up oil spills in small aircraft accidents, the oil does not persist in the environment or persists in such small quantities that no adverse effects would likely occur. In addition, WS’ accidents generally would occur in remote areas away from human habitation and drinking water supplies. Thus, the risk to drinking water appears to be exceedingly low to nonexistent.

For those reasons, the risk of ground fires or fuel/oil pollution from aviation accidents would be low. In addition, based on the history and experience of the program in aircraft accidents, it appears the risk of significant environmental damage from such accidents is exceedingly low.

Consequently, the WS program in North Dakota does not expect the alternative approaches discussed in Section 3.1 to significantly impact soils, geology, minerals, water quality and quantity, floodplains, wetlands, other aquatic resources, air quality, prime and unique farmlands, timber, and range. Therefore, the EA will not analyze those elements further.

Effects from the Use of Lead Ammunition in Firearms

Questions have arisen about the deposition of lead into the environment from ammunition used in firearms to remove predators. As described in Appendix B, the lethal removal of predators with firearms by WS to alleviate damage or threats could occur using a handgun, 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).

The removal of predators by WS using firearms in the State would occur primarily from the use of shotguns and rifles. However, WS’ personnel could employ the use of handguns to euthanize predators. To reduce risks to human safety and property damage from bullets passing through predators, the use of firearms would be applied in such a way (*e.g.*, caliber, bullet weight, distance) to ensure the bullet does not pass through predators. Predators that were removed using firearms would occur within areas where retrieval of predator carcasses for proper disposal is highly likely (*e.g.*, at an airport). With risks of lead exposure occurring primarily from ingestion of bullet fragments, the retrieval and proper disposal of animal carcasses would greatly reduce the risk of scavengers ingesting lead that carcasses may contain.

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

Craig et al. (1999) reported that lead levels in water draining away from a shooting range with high accumulations of lead bullets in the soil around the impact areas were far below the “*action level*” of 15 parts per billion as defined by the EPA (*i.e.*, requiring action to treat the water to remove lead). The study found that the dissolution (*i.e.*, capability of dissolving in water) of lead declines when lead oxides form on the surface areas of the spent bullets and fragments (Craig et al. 1999). Therefore, the lead oxide deposits that form on the surface of bullets and shot serves to reduce the potential for ground or surface water contamination (Craig et al. 1999). Those studies suggest that, given the very low amount of lead that WS could deposit and the concentrations that would occur from WS’ activities to reduce predator damage using firearms, 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 those predators removed by WS using firearms could be lethally removed by the entities experiencing damage using the same method in the absence of WS’ involvement, WS’ assistance with removing those predators would not be additive to the environmental status quo. The proficiency training received by WS’ employees in firearm use and accuracy would increase the likelihood that predators were 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. Based on current information, the risks associated with lead projectiles that WS could contribute to the environment due to misses, the projectile passing through the carcass, or from carcasses that may be irretrievable would be below any level that would pose any risk from exposure or significant contamination.

Influence of Global Climate Change

The State of the Climate in 2012 report indicates that every year has been warmer than the long-term average since 1976 (Blunden and Arndt 2013). Impacts of this change will vary throughout the United States, but some areas will experience air and water temperature increases, alterations in precipitation, and increased severe weather events. Temperature and precipitation often influence the distribution and abundance of a plant or animal species. According to the EPA (2016), as temperatures continue to increase, the ranges of many species will likely expand into northern latitudes and higher altitudes. Species adapted to cold climates may struggle to adjust to changing climate conditions (*e.g.*, less snowfall, range expansions of other species). Sheikh et al. (2007) stated, “*Wildlife species can be affected by several climatic variables such as increasing temperatures, changes in precipitation, and extreme weather events*”. Sheikh et al. (2007) further state that changes in climate could benefit some species of wildlife.

The impact of climate change on wildlife and their habitats is of increasing concern to land managers, biologists, and members of the public. Most of the target predator species that WS could address in the State are abundant across a wide range of climate conditions (*e.g.*, fox, coyote, raccoon, and skunks) and may be relatively resilient to climatic change. Other species may be less tolerant because of their use of specific habitat types that changing climate conditions could negatively influence. For example, climate change may alter the frequency and severity of habitat-altering events, such as wildfires, weather extremes, such as drought, presence of invasive species, and wildlife diseases. WS recognizes that climate change is an ongoing concern and may result in changes in species range and abundance. Climate change may also affect agricultural practices. Over time, the combination of these two factors is likely to lead to changes in the scope and nature of human-wildlife conflicts in the State. Because these types of changes are an ongoing process, this EA has developed a dynamic system, including SOPs, and built in measures that allow agencies to monitor for and adjust to impacts of ongoing changes in the affected environment (see Section 3.3 and Section 3.4).

If the WS program selected an alternative approach to meeting the need for action that allows the program in North Dakota to provide assistance (see Section 3.1), WS would monitor activities, in context of the issues analyzed in detail, to determine if the need for action and the associated impacts remain within the parameters established and analyzed in this EA. Pursuant to SOPs discussed in Section 3.3 and Section 3.4, WS would continue to coordinate activities to reduce and/or prevent predator damage in the State with the NDGFD. The mission of the NDGFD “...is to protect, conserve, and enhance fish and wildlife populations and their habitat for sustained public consumptive and nonconsumptive use” (NDGFD 2016b). Therefore, coordinating activities would ensure the NDGFD had the opportunity to incorporate any activities WS’ conducts into population objectives established for wildlife populations in the State. As part of those coordinated activities, WS would submit annual activity reports to the NDGFD to aid with the ongoing monitoring efforts of the NDGFD. If WS and the NDGFD determined that new needs for action, changed conditions, new issues, or new alternatives having different environmental impacts must be analyzed, WS and the NDGFD would supplement this analysis or conduct a separate evaluation pursuant to the NEPA. Through monitoring, WS and the NDGFD can evaluate and adjust activities as changes occur over time.

WS’ monitoring would also include reviewing the list of species the USFWS considers as threatened or endangered within the State pursuant to the ESA. As appropriate, WS would consult with the USFWS pursuant to Section 7 of the ESA to ensure the activities conducted by WS would not jeopardize the continued existence of threatened or endangered species or result in adverse modification to areas designated as critical habitat for a species within the State. Through the review of species listed as threatened or endangered and the consultation process with the USFWS, the WS program in North Dakota can evaluate and adjust activities conducted pursuant to any alternative approach selected to meet the need for action. Accordingly, WS could supplement this analysis or conduct a separate evaluation pursuant to the NEPA based on the review and consultation process. In this way, any actions conducted by WS would be responsive to ongoing climate changes and the associated cumulative impacts of actions conducted in North Dakota in accordance with the NEPA.

Greenhouse Gas Emissions by the WS Program

Under the alternative approaches intended to meet the need for action discussed in Chapter 3, the WS program in North Dakota could potentially produce criteria pollutants (*i.e.*, pollutants for which maximum allowable emission levels and concentrations are enforced by state agencies). Those activities could include working in the office, travel from office to field locations, travel at field locations (vehicles or ATV), and from aircraft activities. During evaluations of the national program to manage feral swine (*Sus scrofa*), the WS program reviewed greenhouse gas emissions for the entire national WS program (USDA 2015). The analysis estimated effects of vehicle, aircraft, office, and ATV use by WS for FY 2013 and included the potential new vehicle purchases that could be associated with a national program to manage damage caused by feral swine. The review concluded that the range of Carbon Dioxide Equivalents (includes CO₂, NO_x, CH₄, and SO_x) for the entire national WS program would be below the reference point of 25,000 metric tons per year recommended by CEQ for actions requiring detailed review of impacts on greenhouse gas emissions. The activities that WS could conduct under the alternative approaches discussed in Chapter 3 would have negligible cumulative effects on atmospheric conditions, including the global climate.

CHAPTER 3: ALTERNATIVES

Section 3.1 contains a discussion of the alternatives that WS developed to meet the need for action discussed in Chapter 1 and to address the identified issues discussed in Chapter 2. WS developed the alternatives based on the need for action and issues using the WS Decision Model (Slate et al. 1992; see WS Directive 2.201). The alternatives will receive detailed environmental impacts analysis in Chapter 4

(Environmental Consequences). Section 3.2 also discusses alternatives considered but not analyzed in detail, with rationale. In addition, Section 3.3 and Section 3.4 discuss the SOPs that WS would incorporate into the relevant alternatives.

3.1 DESCRIPTION OF THE ALTERNATIVES

WS developed the following alternatives to meet the need for action and address the identified issues associated with managing damage caused by predators in North Dakota.

Alternative 1 - Continue the Current Adaptive Integrated Methods Approach to Managing Predator Damage (No Action/Proposed Action)

Alternative 1 would continue the current implementation of an adaptive integrated methods approach utilizing non-lethal and lethal techniques when WS receives a request for assistance in North Dakota¹². This approach to managing damage associated with predators would integrate the use of the most practical and effective methods to resolve a request for damage management as determined by a site-specific evaluation for each request. WS' personnel would determine the appropriate methods to reduce damage and threats of damage by using the WS Decision Model (see discussion below on the WS Decision Model).

A major goal of the program would be to resolve and prevent damage caused by predators and to reduce threats to human safety. To meet this goal, WS would continue to respond to requests for assistance with, at a minimum, technical assistance, or when funding¹³ was available, direct operational assistance. WS would provide those entities requesting assistance with information regarding the use of appropriate non-lethal and lethal techniques.

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 predators, or 3) providing technical assistance and direct operational assistance to a property owner or manager experiencing damage. To meet the need for action, the objectives of this alternative would be to assist all of the people requesting WS' assistance, within the constraints of available funding and workforce.

WS could provide property owners or managers requesting assistance with information regarding the use of effective and practical non-lethal and lethal techniques. WS would give preference to non-lethal methods when practical and effective under this alternative (see WS Directive 2.101). 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), take the management action themselves, or take no further action.

WS would work with those persons experiencing predator damage to address those predators responsible for causing damage as expeditiously as possible. To be most effective, damage management activities should occur as soon as predators begin to cause damage. Once predators become familiar with a

¹²Alternative 1 was identified as the no action alternative and meets the definition of the no action alternative as defined by the CEQ (CEQ 1981). The CEQ has made two distinct interpretations of what constitutes a "no action" alternative. One interpretation involves the situation where an ongoing program would continue, even as a new plan is being developed. In those cases, "no action" has been interpreted by the CEQ to mean "no change" from the current management direction or level of intensity. The "no action" alternative is considered a continuation of the present course of action until the action is changed.

¹³Funding for WS to conduct damage management activities could occur through federal appropriations, state appropriations, or from cooperative funding.

particular location (*i.e.*, conditioned to an area), dispersing those predators or making the area unattractive can be difficult. WS would work closely with those entities requesting assistance to identify situations where damage could occur and begin to implement damage management activities under this alternative as early as possible to increase the likelihood of those methods achieving the level of damage reduction requested by the cooperating entity.

The WS Decision Model would be the implementing mechanism for a damage management program under Alternative 1 that could be adapted to an individual damage situation. This alternative would allow WS to use the broadest range of methods to address damage or the threat of damage. When WS received a request for direct operational assistance, WS would conduct site visits to assess the damage or threats, would identify the cause of the damage, and would apply the Decision Model described by Slate et al. (1992) and WS Directive 2.201 to determine the appropriate methods to resolve or prevent damage. Discussion of the Decision Model and WS' use of the Model under Alternative 1 occurs below. In addition, WS would give preference to non-lethal methods when practical and effective (see WS Directive 2.101). When receiving requests for assistance associated with feral or free-ranging dogs, the WS program would follow WS Directive 2.340.

Non-lethal methods that would be available for use by WS under this alternative include, but are not limited to minor habitat modification, behavior modification, visual deterrents, live traps, translocation, exclusionary devices, frightening devices, and immobilizing drugs (see Appendix B for a complete list and description of potential methods). Lethal methods that would be available to WS under this alternative include cable devices, the recommendation of harvest during the hunting and/or trapping season, euthanasia chemicals, sodium cyanide (coyotes, fox, feral dogs only), fumigants (coyotes, red fox, striped skunks only), and shooting, including the use of firearms from aircraft. In addition, target predators live-captured using non-lethal methods (*e.g.*, live-traps, immobilizing drugs) could be euthanized. The lethal control of target predators would comply with WS Directive 2.505. The use of sodium cyanide (M-44 devices) to manage damage associated with coyotes, fox, and feral dogs would occur pursuant to WS Directive 2.415. The use of fumigants during denning activities targeting coyotes, red fox, and striped skunks would adhere to WS Directive 2.425.

Discussing methods does not imply that all methods would be used or recommended by WS to resolve requests for assistance and does not imply that all methods would be used to resolve every request for assistance. The most appropriate response would often be a combination of non-lethal and lethal methods, or there could be instances where application of lethal methods alone would be the most appropriate strategy. For example, if an entity requesting assistance had already attempted to alleviate damage using non-lethal methods, WS would not necessarily employ those same non-lethal methods, since the previous use of those methods were ineffective at reducing damage or threats to an acceptable level to the requester.

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

Non-lethal methods can disperse or otherwise make an area unattractive to predators causing damage; thereby, reducing the presence of predators at the site and potentially the immediate area around the site where non-lethal methods were employed. WS' personnel would give preference to non-lethal methods when addressing requests for assistance (see WS Directive 2.101). However, WS' personnel would not necessarily employ non-lethal methods to resolve every request for assistance if deemed inappropriate by WS' personnel using the WS Decision Model, especially when the requesting entity had used non-lethal methods previously and found those methods to be inadequate to resolving the damage or threats of

damage. WS' employees could use non-lethal methods to exclude, harass, and disperse target predators from areas where damage or threats were occurring. When effective, non-lethal methods would disperse predators from an area resulting in a reduction in the presence of those predators at the site where a person employed those methods. For any management methods employed, the proper timing would be essential in effectively dispersing those predators causing damage. Employing methods soon after damage begins or soon after a property owner or manager identifies threats, increases the likelihood that those damage management activities would achieve success in addressing damage. Therefore, coordination and timing of methods would be necessary to be effective in achieving expedient resolution of predator damage.

Under Alternative 1, WS could employ only non-lethal methods when determined to be appropriate for each request for assistance to alleviate damage or reduce threats of damage using the WS Decision Model. In some situations, a cooperating entity has tried to employ non-lethal methods to resolve damage prior to contacting WS for assistance. In those cases, the methods employed by the requester were either unsuccessful or the reduction in damage or threats had not reached a level that was tolerable to the requesting entity. In those situations, WS could employ other non-lethal methods, attempt to apply the same non-lethal methods, or employ lethal methods. In many situations, the implementation of non-lethal methods, such as exclusion-type barriers, would be the responsibility of the requester, which means that, in those situations, the only function of WS would be to implement lethal methods, if determined to be appropriate using the WS Decision Model.

WS could employ lethal methods to resolve damage associated with those predators identified by WS as responsible for causing damage or threats to human safety under this alternative; however, WS would only employ lethal methods after receiving a request for the use of those methods. The use of lethal methods could result in local population reductions in the area where damage or threats were occurring since people could remove individual predators from the population. WS and other entities often employ lethal methods to reinforce non-lethal methods and to remove predators that WS or other entities identify as causing damage or posing a threat to human safety. The number of predators removed from the population using lethal methods under Alternative 1 would be dependent on the number of requests for assistance received, the number of predators involved with the associated damage or threat, and the efficacy of methods employed.

Often of concern with the use of lethal methods is that predators that were lethally removed would only be replaced by other predators either after the application of those methods (*e.g.*, predators that relocate into the area) or by predators the following year (*e.g.*, increase in reproduction and survivability that could result from less competition). As stated previously, WS' personnel would not use lethal methods as population management tools over broad areas. The intent of using lethal methods would be to reduce the number of predators present at a specific location where damage was occurring by targeting those predators causing damage or posing threats. The intent of lethal methods would be to manage damage caused by individual predators and not to manage entire predator populations.

Most lethal and non-lethal methods currently available provide only short-term benefits when addressing predator damage. The intended use of those methods would be to reduce damage occurring at the time those methods were employed but do not necessarily ensure predators would not return once those methods were discontinued. Long-term solutions to resolving predator damage would often be difficult to implement and can be costly. In some cases, long-term solutions involve exclusionary devices, such as fencing, or other practices that would not be costly or difficult to implement such as closing garbage cans. When addressing predator damage, long-term solutions generally involve modifying existing habitat or making conditions to be less attractive to predators. To ensure complete success, alternative sites in areas where damage was not likely to occur would often be required to achieve complete success in reducing damage and to avoid moving the problem from one area to another. Modifying a site to be less attractive

to predators would likely result in the dispersal of those predators to other areas where damage could occur or could result in multiple occurrences of damage situations.

WS may recommend predators be harvested during the regulated hunting and/or trapping season in an attempt to reduce the number of predators causing damage. Managing predator populations over broad areas could lead to a decrease in the number of predators causing damage. Establishing hunting or trapping seasons and the allowed harvest levels during those seasons is the responsibility of the NDGFD. WS does not have the authority to establish hunting or trapping seasons or to set allowed harvest numbers during those seasons.

Appendix B contains a complete list of methods available for use under this alternative. However, listing methods neither implies that all methods would be used by WS to resolve requests for assistance nor does the listing of methods imply that all methods would be used to resolve every request for assistance. As part of an integrated approach, WS may provide technical assistance and direct operational assistance to those people experiencing damage associated with predators when those persons request assistance from WS.

Technical Assistance Recommendations

Under Alternative 1, WS could provide technical assistance to those persons requesting assistance with managing damage as part of an integrated methods approach. Technical assistance provided by WS would occur as described in Alternative 3 of this EA. Education is an important element of technical assistance because wildlife damage management is about finding balance and coexistence between the needs of people and needs of wildlife. This is extremely challenging as nature has no balance, but rather is in continual flux. In addition to the routine dissemination of recommendations and information to individuals or organizations, WS provides lectures, courses, and demonstrations to producers, homeowners, state and county agents, colleges and universities, and other interested groups. WS frequently cooperates with other entities in education and public information efforts. Additionally, WS' employees would continue to write technical papers and provide presentations at professional meetings and conferences so that other wildlife professionals and the public are aware of recent developments in damage management technology, programs, laws and regulations, and agency policies.

Direct Operational Assistance

Operational damage management assistance would include damage management activities that WS' personnel conduct directly or activities that WS' employees supervise. Initiation of operational damage management assistance could occur when the problem could not be effectively resolved through technical assistance alone and there was a written MOU, work initiation document, or other comparable document signed between WS and the entity requesting assistance. The initial investigation by WS' personnel would define 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 could be required to resolve problems effectively, especially if chemical methods were necessary or if the problems were complex.

Research and Development

The National Wildlife Research Center (NWRC) functions as the research unit of WS by providing scientific information and the development of methods for wildlife damage management, which are effective and environmentally responsible (see WS Directive 2.115, WS Directive 2.120). Research biologists with the NWRC work closely with wildlife managers, researchers, and others to develop and evaluate methods and techniques for managing wildlife damage. Research biologists with the NWRC

have authored hundreds of scientific publications and reports based on research conducted involving wildlife and methods.

WS' Decision Making Procedures

The WS Decision Model (see WS Directive 2.201) described by Slate et al. (1992) depicts how WS' personnel would use a thought process for evaluating and responding to damage complaints. WS' personnel would 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, WS' employees would incorporate methods deemed practical for the situation into a damage management strategy. After WS' employees implemented this strategy, employees would continue to monitor and evaluate the strategy to assess effectiveness. If the strategy were effective, the need for further management would end. In terms of the WS Decision Model, most efforts to resolve wildlife damage consist of continuous feedback between receiving the request and monitoring the results of the damage management strategy. The Decision Model is not a written documented process, but a mental problem-solving process common to most, if not all, professions, including WS.

The general thought process and procedures of the WS Decision Model would include the following steps.

1. **Receive Request for Assistance:** WS would only provide assistance after receiving a request for such assistance. WS would not respond to public bid notices.
2. **Assess Problem:** First, WS would make a determination as to whether the assistance request was within the authority of WS. If an assistance request were within the authority of WS, WS' employees would gather and analyze damage information to determine applicable factors, such as what species was responsible for the damage, the type of damage, the extent of damage, and the magnitude of damage. Other factors that WS' employees could gather and analyze would include the current economic loss or current threat (*e.g.*, threat to human safety), the potential for future losses or damage, the local history of damage, and what management methods, if any, were used to reduce past damage and the results of those actions.
3. **Evaluate Management Methods:** Once a problem assessment was completed, a WS' employee would conduct an evaluation of available management methods. The employee would evaluate available methods in the context of their legal and administrative availability and their acceptability based on biological, environmental, social, and cultural factors.
4. **Formulate Management Strategy:** A WS' employee would formulate a management strategy using those methods that the employee determines to be practical for use. The WS employee would also consider factors essential to formulating each management strategy, such as available expertise, legal constraints on available methods, costs, and effectiveness.
5. **Provide Assistance:** After formulating a management strategy, a WS employee could provide technical assistance and/or direct operational assistance to the requester (see WS Directive 2.101).
6. **Monitor and Evaluate Results of Management Actions:** When providing direct operational assistance, it is necessary to monitor the results of the management strategy. Monitoring would be important for determining whether further assistance was required or whether the management strategy resolved the request for assistance. Through monitoring, a WS' employee would continually evaluate the management strategy to determine whether additional techniques or modification of the strategy was necessary.
7. **End of Project:** When providing technical assistance, a project would normally end after a WS' employee provided recommendations or advice to the requester. A direct operational assistance project would normally end when WS' personnel stop or reduce the damage or threat to an acceptable level to the requester or to the extent possible. Some damage situations may require

continuing or intermittent assistance from WS' personnel and may have no well-defined termination point.

Community-based Decision Making

WS could receive requests for assistance from community leaders and/or representatives. In those situations, the WS program in North Dakota, under this alternative, would follow the “*co-managerial approach*” to solve wildlife damage or conflicts as described by Decker and Chase (1997). Within this management model, WS could provide technical assistance regarding the biology and ecology of predators 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 were available. Under this approach, resource owners within a community and other community members directly or indirectly affected by predator damage or the management of damage would have direct input into the resolution of such problems. They may implement management recommendations provided by WS or others, or may request direct operational assistance from WS, other wildlife management agencies, local animal control agencies, private businesses, or seek no further assistance.

The community representative(s) and/or decision-maker(s) for the local community would be elected officials or representatives of the communities. The community representative(s) and/or decision-maker(s) who oversee the interests and business of the local community would generally be residents of the local community or appointees that other members of the community popularly elected. This person or persons would represent the local community's interest and make decisions for the local community or bring information back to a higher authority or the community for discussion and decision-making. Identifying the decision-maker for local business communities can be more complex because building owners may not indicate whether the business must manage wildlife damage themselves, or seek approval to manage wildlife from the property owner or manager, or from a governing Board.

Under a community based decision-making process, WS could provide information, demonstration, and discussion on available methods to the appropriate representative(s) of the community and/or community decision-maker(s) that requested assistance, which would help ensure that decisions made by representatives of the community and/or the decision-makers were based on community-based input. WS would only provide direct operational assistance if the local community representative(s) and/or decision-maker(s) requested such assistance and only if the assistance requested was compatible with WS' recommendations.

By involving community representatives and/or community decision-makers in the process, WS could present information that would allow decisions on damage management to involve those individuals that the representatives and/or decision-maker(s) represent. As addressed in this EA, WS could provide technical assistance to the appropriate representative(s) and/or decision-maker(s), including demonstrations and presentation by WS at public meetings to allow for involvement of the community. Requests for assistance to manage damage caused by predators often originate from the decision-maker(s) based on community feedback or from concerns about damage or threats to human safety. As representatives of the community, the community representative(s) and/or decision-maker(s) would be able to provide the information to local interests either through technical assistance provided by WS or through demonstrations and presentation by WS on damage management activities. This process would allow WS, the community representative(s), and/or decision-maker(s) to make decisions on damage management activities based on local input. The community leaders could 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.

Private Property Decision-makers

In the case of private property owners, the decision-maker is the individual that owns or manages the affected property. The decision-maker has the discretion to involve others as to what occurs or does not occur on property they own or manage. Therefore, in the case of an individual property owner or manager, the involvement of others and to what degree others were involved in the decision-making process would be a decision made by that individual. WS could provide direct operational assistance when requested; however, WS would only provide assistance if the requested management actions were in accordance with WS' recommendations.

Public Property Decision-makers

The decision-maker for local, state, or federal property would be the official responsible for or authorized to manage the public land to meet interests, goals, and legal mandates for the property. WS could provide technical assistance to this person and make recommendations to reduce damage. WS could provide direct operational assistance when requested; however, WS would only provide assistance if the requested management actions were in accordance with WS' recommendations.

Alternative 2 – WS Would Address Predator Damage through an Adaptive Integrated Approach Using Only Non-lethal Methods

Under this alternative, WS would implement an adaptive integrated methods approach as described under Alternative 1; however, WS would only consider non-lethal methods when formulating approaches to resolve damage associated with predators, wherever a property owner requests such assistance. WS could provide technical assistance and/or direct operational assistance similar to Alternative 1. The only methods that WS could recommend or use would be the non-lethal methods described in Appendix B and those methods would be identical to those non-lethal methods available and discussed under Alternative 1. Under this alternative, non-lethal methods would include fencing, deterrents/repellents, pyrotechnics, electronic guards (siren strobe-light devices), visual deterrents, fladry, exclusion, harassment, minor habitat alteration, cage traps, foothold traps, cable devices, decoy dogs, tracking dogs, and translocation (see Appendix B for a complete list). If WS were to conduct operational assistance, WS' personnel would translocate predators because lethal methods would be unavailable. Under this alternative, WS would not use fumigants, firearms, sodium cyanide (M-44 devices), or euthanasia chemicals.

WS would refer requests for information regarding lethal methods to the NDGFD, the NDDA, and/or private entities. Although WS would not recommend or use lethal methods under this alternative, other entities, including private entities, could continue to use lethal methods to resolve damage or threats. Property owners or managers could still resort to lethal methods or other methods not recommended by WS.

Alternative 3 – Predator Damage Management by WS through Technical Assistance Only

Under this alternative, WS would provide those cooperators requesting assistance with technical assistance only. Similar to Alternative 1 and Alternative 2, WS could receive requests for assistance from community representatives, private individuals/businesses, or from public entities. Technical assistance would provide those cooperators experiencing damage or threats associated with predators with information, demonstrations, and recommendations on available and appropriate methods. The implementation of methods and techniques to resolve or prevent damage would be the responsibility of the requester with no direct involvement by WS. In some cases, WS may provide supplies or materials that were of limited availability for use by private entities (e.g., loaning of cage traps). Technical

assistance may be provided through a personal or telephone consultation, or during an on-site visit with the requester. Generally, WS would describe several management strategies to the requester for short and long-term solutions to managing damage. WS would base those strategies on the level of risk, need, and the practicality of their application. WS would use the Decision Model to recommend those methods and techniques available to the requester to manage damage and threats of damage. Those persons receiving technical assistance from WS could implement those methods recommended by WS, could employ other methods not recommended by WS, could seek assistance from other entities, or take no further action.

Under a technical assistance only alternative, WS would recommend an integrated approach similar to Alternative 1 and Alternative 2 when receiving a request for assistance; however, WS would not provide direct operational assistance under this alternative. WS would give preference to non-lethal methods when practical and effective under this alternative (see WS Directive 2.101). WS would base method and technique recommendations on information provided by the individual(s) seeking assistance using the WS Decision Model. In some instances, wildlife-related information provided to the requester by WS would result in tolerance/acceptance of the situation. In other instances, WS would discuss and recommend damage management options. WS would only recommend or loan those methods legally available for use by the appropriate individual. Similar to Alternative 1 and Alternative 2, those methods described in Appendix B would be available to those persons experiencing damage or threats associated with predators in the State; however, immobilizing drugs, euthanasia chemicals, sodium cyanide, and the shooting from an aircraft would have limited availability to the public and other entities under this alternative and Alternative 4. Licensed veterinarians or people under their supervision would be the only entities that could use immobilizing drugs and euthanasia chemicals. The availability of aircraft would also be limited, especially shooting from an aircraft. Shooting from an aircraft by entities other than WS to alleviate damage or threats of damage would require a permit from the NDGFD (see NDAC 30-02-01).

The WS program in the State regularly provides technical assistance to individuals, organizations, and other federal, state, and local government agencies for managing predator damage. Technical assistance would include collecting information about the species involved, the extent of the damage, and previous methods that the cooperator had attempted to resolve the problem. WS would then provide information on appropriate methods that the cooperator could 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.

This alternative would place the immediate burden of operational damage management work on the resource owner, other governmental agencies, and/or private businesses. Those persons experiencing damage or were concerned with threats posed by predators could seek assistance from other governmental agencies, private entities, or conduct damage management on their own. Those persons experiencing damage or threats could take action using those methods legally available to resolve or prevent predator damage as permitted by federal, state, and local laws and regulations or those persons could take no action.

Alternative 4 - No Predator Damage Management Conducted by WS

This alternative would preclude all activities by WS to reduce threats to human health and safety, and to alleviate damage to agricultural resources, property, and natural resources. WS would not provide assistance with any aspect of managing damage caused by predators in the State. WS would refer all requests for assistance to resolve damage caused by predators to the NDGFD, the NDDA, other governmental agencies, and/or private entities.

Despite no involvement by WS in resolving damage and threats associated with predators in the State, those persons experiencing damage caused by predators could continue to resolve damage by employing

those methods legally available since the removal of predators to alleviate damage or threats could occur despite the lack of involvement by WS. Similar to the other alternatives, most of those methods described in Appendix B would be available to those people experiencing damage or threats associated with predators in the State; however, immobilizing drugs, euthanasia chemicals, sodium cyanide, and the use of a firearm from an aircraft would have limited availability to the public and other entities under this alternative. Licensed veterinarians or people under their supervision would be the only entities that could use immobilizing drugs and euthanasia chemicals. The availability of aircraft would also be limited, especially shooting from an aircraft. Shooting from an aircraft by entities other than WS to alleviate damage or threats of damage would require a permit from the NDGFD.

Under this alternative, those persons experiencing damage or threats of damage could contact WS; however, WS would immediately refer the requester to the NDGFD, the NDDA, and/or to other entities. The requester could contact other entities for information and assistance with managing damage, could take actions to alleviate damage without contacting any entity, or could take no further action.

3.2 ALTERNATIVES CONSIDERED BUT NOT ANALYZED IN DETAIL WITH RATIONALE

In addition to those alternatives analyzed in detail, WS and the NDGFD identified several additional alternatives. However, those alternatives will not receive detailed analyses for the reasons provided. Those alternatives considered but not analyzed in detail include the following.

The WS Program would Compensate People for Predator Damage

The compensation alternative would require WS to establish a system to reimburse persons impacted by predator damage and to seek funding for the program. 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. Evaluation of this alternative indicates that a compensation only alternative has many drawbacks. Compensation would require large expenditures of money and labor to investigate and validate all damage claims, and to determine and administer appropriate compensation. Compensation most likely would be below full market value and would give little incentive to resource owners to limit damage through improved cultural or other practices and management strategies. In addition, providing compensation would not be practical for reducing threats to human health and safety.

The WS Program would establish a Bounty System for Predators

This alternative would require the WS program to establish a system that paid people for each predator they killed. A standard problem with bounties is that the circumstances surrounding the lethal removal of animals are typically unknown and completely unregulated, which is contrary to the tenants of the North American Model of Wildlife Conservation (Geist 2006, Organ et al. 2010). WS concurs because of several inherent drawbacks and inadequacies in the payment of bounties. Bounties are often ineffective at controlling damage over a wide area, such as across the entire State. The circumstances surrounding the removal of animals are typically unknown and completely unregulated because it is difficult or impossible to assure people did not remove animals claimed for bounty from outside the area where damage was occurring. In addition, WS does not have the authority to establish a bounty program.

The WS Program would Refer People to Private Nuisance Wildlife Control Agents or Trappers

Under this alternative, the WS program would refer all entities requesting assistance to private individuals or companies (*e.g.*, private trappers, wildlife control companies). People experiencing damage caused by predators could contact wildlife control agents and private entities to reduce predator damage when

deemed appropriate by the resource owner. In addition, WS could refer persons requesting assistance to agents and/or private individuals under all of the alternatives fully evaluated in the EA.

WS Directive 3.101 provides guidance on establishing cooperative projects and interfacing with private businesses. WS would only respond to requests for assistance received directly and would not respond to public bid notices. When responding to requests for assistance, WS would inform requesters that other service providers, including private entities, might be available to provide assistance.

The WS Program would Implement Non-lethal Methods before Lethal Methods

This alternative would require that WS apply non-lethal methods or techniques described in Appendix B to all requests for assistance to reduce damage and threats to safety from predators in the State. If the use of non-lethal methods failed to resolve the damage situation or reduce threats to human safety at each damage situation, WS could then employ lethal methods to reduce damage or the threat of damage. WS would apply non-lethal methods 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 other entities or by those persons experiencing predator damage but would only prevent the use of those methods by WS until WS had employed non-lethal methods. The WS program could recommend the use of lethal methods through technical assistance under this alternative; however, the operational use of lethal methods would only occur after the use of non-lethal methods had proven ineffective.

Some non-lethal methods available to alleviate damage or threats associated with predators are impractical for implementation by WS' personnel, such as altering livestock management practices (*e.g.*, night-penning, herding, carcass removal) and physical exclusion (*e.g.*, predator-proof fencing). Those persons experiencing damage often employ non-lethal methods to reduce damage or threats prior to contacting the WS program. Implementation of most non-lethal methods for livestock protection falls within the purview of the livestock producer (Knowlton et al. 1999). Many of those non-lethal methods (*e.g.*, fencing and guard animals) require a large investment in time to implement and have a high initial cost (Mitchell et al. 2004). Even with the additional effort and costs, those methods are not always effective at reducing damage and potentially have side effects (*e.g.*, concentrating livestock can cause unwanted damage to particular pasture areas) (Knowlton et al. 1999).

Producers in the United States spent nearly \$188.5 million dollars on non-lethal methods to reduce cattle and calf losses from predation by animals in 2010 (NASS 2011). The primary non-lethal method employed by cattle producers in North Dakota was the use of guard animals with a reported 38.6% of producers using guard animals. Producers also reported using additional non-lethal methods, with 30.8% using culling, 26.6% using frequent checks, 20.8% using livestock carcass removal, 19.2% using exclusion fencing, 16.4% using fright tactics, 11.5% using other non-lethal methods, 1.5% using herding, and 1.0% reporting the use of night penning (NASS 2011).

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, WS could only evaluate the presence or absence of non-lethal methods. Alternative 1 and Alternative 3 would be similar to a non-lethal before lethal alternative because WS' personnel would give preference to the use of non-lethal methods before lethal methods (see WS Directive 2.101). Adding a non-lethal before lethal alternative and the associated analysis would not contribute additional information to the analyses in the EA.

WS Would Require Cooperators Pay All of the Cost of Lethal Removal to Increase the Availability of Funding for Assistance using Non-lethal methods

This alternative would be nearly identical to Alternative 1. The WS program in North Dakota would continue to implement and recommend an adaptive integrated methods approach when the program receives a request for assistance. All of the methods discussed in the EA and Appendix B would continue to be available for use by the WS program in North Dakota. However, under this alternative, when an entity requests assistance and allows the WS program to use lethal methods, the entity requesting assistance would pay all the costs associated with WS' use of those lethal methods. Therefore, any other funding provided to the WS program in North Dakota would be available for the implementation of non-lethal methods.

However, implementation of this alternative would have adverse consequences in terms of unequal access to federal assistance with managing damage caused by predators. In some instances, cooperators contact WS after using non-lethal methods on their own but those non-lethal methods failed to resolve their damage problem. For example, cattle producers in the United States reported spending an estimated \$188.5 million on non-lethal methods in 2010 just to reduce depredation on cattle (NASS 2011). Under this alternative, those producers who implement non-lethal methods would have to bear the fiscal burden of paying for WS' assistance with lethal methods even though they had made a good-faith effort to implement appropriate non-lethal methods. In contrast, a producer who had not implemented non-lethal methods or had only engaged in limited use of non-lethal methods on their own prior to contacting WS would qualify for federal assistance with non-lethal methods.

Additionally, the availability and efficacy of damage management methods are not equal for all types of damage. Consequently, WS would not have the ability to provide assistance equally because available public funding would only be available to individuals experiencing conflicts with predators based on the availability of suitable effective non-lethal methods and not on actual need for assistance or effort in seeking to implement non-lethal methods on their own.

This alternative would also be problematic when considered in context of Executive Order 12898 (see Section 1.6). If the WS program in North Dakota implemented this alternative, the ability of the producer to afford to pay the expenses when WS' personnel used lethal methods would determine access to assistance from WS. Low-income people may not have the ability to pay for assistance from WS, particularly if they have already recently paid to implement new non-lethal methods. It is the policy of WS to use available public funds to assist people equally based on the need for action, not on their ability to pay for assistance. The WS program in North Dakota did not consider this alternative in detail because of concerns associated with unequal access to federal fiscal assistance with managing damage caused by predators.

WS would implement a Non-lethal Damage Management program similar to the Marin County, California Program

Following public concerns over the use of lethal methods to manage predator damage, the Board of Supervisors in Marin County, California replaced a cooperative program between Marin County, the California Department of Food and Agriculture, and the WS program in California with a county-administered, program that promotes and provide some reimbursement to livestock producers that implement non-lethal methods. The County Agricultural Commissioner supervises the county program. Under the current program in Marin County, qualified ranchers are provided reimbursement to assist in the implementation of non-lethal methods to reduce livestock predation (*e.g.*, through new fence construction or improvements to existing fences, guard animals, scare devices, or changes in animal

husbandry) (Larson 2006, Fox 2008). The program provides a cost share mechanism that provides funds for purchasing fencing materials and guard animals (Larson 2006, Fox 2008).

To qualify for the program, livestock producers in the County must have at least 25 head of livestock and must utilize two non-lethal methods to deter predation verified by the Marin County Agricultural Commissioner. In addition, the cost-share reimbursement that livestock producers in the County can receive annually depends on the size of their livestock herd. For example, Fox (2008) reported that livestock producers with 200 head or more were eligible to receive up to \$2,000, which was the maximum amount a producer could receive annually. Livestock producers with herds of between 25 and 199 head could receive up to \$500 annually. Although the program provides cost-share reimbursement to livestock producers in the county for expenses associated with non-lethal methods, livestock producers can still use lethal methods and/or seek the assistance of other entities to employ lethal methods.

The environmental consequences associated with the implementation of Alternative 2 discussed in Section 3.1 would be similar to this alternative. In addition, if a federal, state, and/or county entity provides funding for cost share reimbursement to livestock producers similar to the program implemented in Marin County, California, WS could implement a similar program under Alternative 1, Alternative 2, or Alternative 3. Although Alternative 1 and Alternative 3 could include the implementation and/or recommendation of lethal methods by the WS program in North Dakota (see Section 3.1), they would not require the WS program to use and/or recommend lethal methods to address all requests for assistance. In addition, a county or other entity could implement a program similar to the Marin County, California program on their own under any of the alternatives discussed.

A drawback to implementing a program similar to the program in Marin County, California would be the inability of the program to address several of the needs for action identified in Section 1.2. The Marin County program only provides cost share reimbursement to livestock producers in a single county within California. The program does not provide assistance with predator damage to other types of agricultural resources, damage to property, or provide assistance with managing threats to human health and safety. Larson (2006) provides a discussion on the many limitations of the Marin County program, including the difficulties of transferring the program to other areas. WS has determined that detailed analysis of this alternative would not provide substantive new information to aid decision-making; therefore, the WS program in North Dakota will not conduct a detailed analysis of this alternative at this time. The WS program in North Dakota based this determination on the limitations of the Marin County program noted by Larson (2006), the failure of the program to address all the needs for action presented in Section 1.1, and the similarity of this alternative to other alternatives discussed in Section 3.1.

Use of Lethal Methods Only by WS

This alternative would require WS' personnel to use lethal methods only when providing assistance with managing threats and damage associated with predators. However, non-lethal methods can be effective in preventing damage in certain instances. Under WS Directive 2.101, WS must consider the use of non-lethal methods before lethal methods. In those situations where application of the WS Decision Model determines that using non-lethal methods would effectively reduce or prevent damage, WS' personnel would employ or recommend those methods. Therefore, WS did not consider this alternative in detail.

WS would only use Live-capture Methods and would Translocate Predators to Other Areas

Under this alternative, WS would address all requests for assistance using live-capture methods or the recommendation of live-capture methods and WS would translocate all predators live-captured. Predators would be live-captured using immobilizing drugs, live-traps, foothold traps, or cable devices. The success of translocation efforts would depend on efficiently capturing target predators and the existence

of an appropriate release site (Nielsen 1988). WS would identify release sites prior to live-capture to ensure appropriate sites were available before initiating any activities.

The NDGFD would have to approve and authorize the translocation and release of the individual target animals. The translocation of predators could only occur under the authority of the NDGFD. Therefore, the translocation of predators by WS would only occur as directed by the NDGFD. In addition, the property owner would have to authorize WS to release target animals on their property. When the NDGFD authorizes translocation of target animals and when a property owner approves of WS releasing animals on their property, WS could translocate animals or recommend translocation under Alternative 1 and under Alternative 2. In addition, WS could recommend translocation under Alternative 3. Translocation by other entities could also occur under all of the alternatives.

Translocation may be appropriate in some situations when a species' population is low. However, most predators are abundant in much of the suitable habitat in North Dakota, and translocation is not necessary for the maintenance of viable populations in the State. Because predator populations are abundant in North Dakota, the predators that WS translocated and released into suitable habitat would very likely encounter other predators with established territories. For example, coyotes are territorial, and introducing translocated coyotes into new areas often disorients the coyotes because they are unfamiliar with their surroundings. Therefore, translocated coyotes could often be at a disadvantage. Territorial coyotes often viciously attack other coyotes that wander into their territories and those injuries sustain during those attacks oftentimes causes the death of translocated coyote. Survival of translocated animals is generally very poor due to the stress of translocation, and in many cases, released animals suffer mortality in a new environment (Craven et al. 1998).

Translocation of wildlife is also discouraged by WS policy (see WS Directive 2.501) because of the stress to the translocated animal, threat of spreading diseases, poor survival rates, and the difficulties that translocated wildlife have with adapting to new locations or habitats (Dickens et al. 2010, Massei et al. 2010, Whisson et al. 2012). Since WS does not have the authority to translocate predators in the State unless permitted by the NDGFD, WS did not consider this alternative in detail.

WS would use Non-lethal Methods and Approved Euthanasia Only to Address Damage

Under this alternative, WS would continue to employ an integrated methods approach but would only employ non-lethal methods to exclude, harass, or live-capture target predator species. When deemed appropriate, WS could continue to remove target predators lethally; however, under this alternative, WS would only use methods that captured target predators alive. Once live-captured, WS' personnel would euthanize target animals using methods that meet the definition of euthanasia as defined by the AVMA.

Euthanasia methods would be restricted to those defined by the AVMA (2013) as acceptable or acceptable with conditions, and would include sodium pentobarbital, potassium chloride, carbon dioxide, and firearms (once live-captured). This alternative would be similar to Alternative 1 since WS would give preference to the use of non-lethal methods when practical and effective (see WS Directive 2.101). In addition, WS' personnel would be familiar with the euthanasia methods described by the AVMA and would use those methods to euthanize captured or restrained animals, whenever practicable (see WS Directive 2.430, WS Directive 2.505). Therefore, WS did not consider this alternative in detail.

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

Under this alternative, the only method that would be available to resolve requests for assistance by WS would be the recommendation and the use of methods that reduce or prevent reproduction in predators responsible for causing damage. Wildlife professionals often consider reproductive inhibitors for use

where wildlife populations are overabundant and where traditional hunting or lethal control programs were not publicly acceptable (Muller et al. 1997). Wildlife professionals could achieve a reduction in local wildlife populations through natural mortality combined with reduced fecundity. However, population dynamic characteristics (*e.g.*, longevity, age at onset of reproduction, population size, and biological/cultural carrying capacity), habitat and environmental factors (*e.g.*, isolation of target population, cover types, and access to target individuals), socioeconomic, and other factors often limit the use and effectiveness of reproductive control as a tool for wildlife population management. Population modeling indicates that reproductive control is more efficient than lethal control only for some rodent and small bird species with high reproductive rates and low survival rates (Dolbeer 1998). Additionally, the need to treat a sufficiently large number of target animals, multiple treatments, and population dynamics of free-ranging populations place considerable logistic and economic constraints on the adoption of reproduction control technologies as a wildlife management tool for some species.

Reproductive control for wildlife can occur through sterilization (permanent) or contraception (reversible). Sterilization could be accomplished through: 1) surgical sterilization (vasectomy, castration, and tubal ligation), 2) chemosterilization, and 3) through gene therapy. Contraception could be accomplished through: 1) hormone implantation (synthetic steroids such as progestins), 2) immunocontraception (contraceptive vaccines), and 3) oral contraception (progestin administered daily). Currently, chemical reproductive inhibitors are not available for use to manage predator populations.

Bromley and Gese (2001*a*, 2001*b*) conducted studies to determine if surgically sterilized coyotes would maintain territories and pair bond behavior characteristics of unsterilized coyotes, and if predation rates by sterilized coyote pairs would decrease. The results indicated that behaviorally, sterile coyote pairs appeared to be no different from unsterilized pairs, except for predation rates on lambs. Unsterilized coyote packs were six times more likely to prey on sheep than were sterilized packs (Bromley and Gese 2001*b*). Bromley and Gese (2001*b*) believed this occurred because sterile packs did not have to provision pups and food demands were lower. Therefore, sterilization could be an effective method to reduce lamb predation if wildlife professionals could capture and sterilize enough coyote breeding pairs. Bromley and Gese (2001*a*, 2001*b*) captured as many coyotes as possible from all packs on their study area and controlled coyote exploitation (mortality) on their study area. During their studies, Bromley and Gese (2001*a*, 2001*b*) found survival rates for coyotes in the unexploited study area were similar to those survival rates reported for mostly unexploited wild coyote populations. Seidler and Gese (2012) found similar results. Bromley and Gese (2001*b*) concluded a more effective and economical method of sterilizing resident coyotes was needed to make sterilization a practical management tool on a larger scale. Seidler et al. (2014) concluded that surgical sterilization of coyotes could reduce predation rates on pronghorn (*Antilocapra americana*) fawns.

Surgical sterilization would require that each animal be captured and sterilization conducted by licensed veterinarians, which could be labor intensive and expensive. Given the costs associated with live-capturing and performing sterilization procedures on predators and the lack of availability of chemical reproductive inhibitors for the management of predator populations, this alternative was not evaluated in detail. As alternative methods of delivering chemosterilants are developed, sterilization may prove to be a practical tool in some circumstances (DeLiberto et al. 1998). If reproductive inhibitors become available and research proves those inhibitors are effective in reducing localized predator populations, WS could evaluate the use of the inhibitor as a method available to manage damage.

WS would not Use Lethal Methods until More Rigorous Scientific Testing Shows an Individual Method to be Effective

Some people have questioned the efficacy of lethal tools and techniques to manage wildlife damage and express their opposition to their use. A recent paper published by Treves et al. (2016) criticizes certain

research on lethal methods and they recommend suspending the use of those methods until more rigorous scientific testing prove their efficacy. Treves et al. (2016) advocate for new study designs that use the same standards as those in controlled laboratory settings for biomedical research. Research scientists with the NWRC have evaluated the paper published by Treves et al. (2016) and do not agree with the assessment that existing research is flawed. Further, field studies and laboratory studies require different study designs. After review of the paper published by Treves et al. (2016), the WS program the critique contained serious errors in interpretation of field-study designs that are well established.

There are important differences between research studies conducted in a field environment and studies in biomedical laboratory settings. Field research inherently brings in variables such as weather, varying habitat quality, and movement of wildlife that researchers cannot control. Researchers in field settings must make assumptions when trying to answer complex ecological questions in field settings. Researchers address and acknowledge those variables in field research using well-established and recognized field study designs, such as the switch-back and paired block designs. In addition, the paper published by Treves et al. (2016) did not accurately interpret or represent the studies' designs or results of at least two research papers they analyzed, which raises questions regarding additional misrepresentations and errors in their paper.

WS agrees that tools and techniques that people use to manage wildlife damage must be based on scientifically sound principles. Research scientists at the NWRC are dedicated to gathering information, testing new ideas and methods, and using experiments (versus observational studies) as much as possible. Research scientists with the NWRC are leaders in the design and implementation of controlled studies to evaluate methods. Scientists with the NWRC collaborate with experts from around the world to conduct those studies and they often publish their findings in peer-reviewed literature¹⁴. A more detailed evaluation of Treves et al. (2016) is contained in Appendix E.

Because of site-specific variations in the efficacy of methods, the WS Decision Model, discussed in Section 3.1, allows WS' personnel to continually evaluate activities at each project site and adjust the methods as needed to achieve management objectives while also minimizing environmental impacts. Therefore, WS' personnel would consider the effectiveness of methods as part of the decision making-process when WS' personnel use the Decision Model for each request for assistance by continually evaluating methods and the results. Therefore, the WS program did not address the efficacy of methods as a separate issue in detail.

WS has determined that detailed analysis of this alternative would not provide substantive new information to aid the decision-maker. The WS program in North Dakota based this determination on the deficiencies of the paper published by Treves et al. (2016) that WS discussed previously and further discusses in Appendix E. In addition, the implementation of this alternative would be similar to Alternative 2 discussed in Section 3.1; therefore, the WS program in North Dakota will not conduct a detailed analysis of this alternative at this time.

WS would only Conduct Activities after Damage Had Occurred

Managing damage proactively and reactively are the general approaches to alleviating damage cause by predators (Baker et al. 2008). Proactive damage management would be the application of methods to target predators prior to damage occurrences based on historical damage that has occurred (*i.e.*, based on a threat of damage) and the risk of damage. As requested and appropriate, the WS program provides

¹⁴At the time this EA was developed, many of the papers published by scientists with the NWRC that address predators can be found by visiting the website at https://www.aphis.usda.gov/aphis/ourfocus/wildlifedamage/programs/nwrc/research-areas/predator-research/ct_predators_publications.

information, conducts demonstrations, or take actions to prevent damage from recurring. For example, in areas where substantial livestock depredation has historically occurred, WS could provide information about guard dogs, fences, or other husbandry techniques, or be requested to provide direct operational assistance to remove predators prior to the period of greatest risk. Reactive damage management would be the application of methods targeting predators in response to an incurred loss with the intent of abating or reducing further losses (*i.e.*, after damage has already occurred). Under this alternative, the WS program would only provide reactive assistance and only conduct activities after damage has occurred. WS would provide no proactive assistance; however, other entities could continue to provide proactive assistance by conducting activities based on a threat of damage. WS would only conduct activities based on a request for assistance. The use of both proactive and reactive damage management can increase the likelihood of reducing damage to acceptable thresholds (Conover 2002, Baker et al. 2008).

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 determined that a forest supervisor could establish a need for wildlife damage management if the supervisor could show that damage from wildlife was threatened (Civil No. 92-C-0052A January 20, 1993). The Court stated that, "*The agency need not show that a certain level of damage is occurring before it implements a [WS] Program... Hence, to establish need for [WS], the forest supervisors need only show that damage from predators is threatened.*" 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.

WS should establish a Loss Threshold before Allowing Lethal Methods

One issue identified through WS' implementation of the NEPA processes is a concern that WS or other entities should establish a threshold of loss before employing lethal methods to resolve damage and that wildlife damage should be a cost of doing business. In some cases, cooperators likely tolerate some damage and economic loss until the damage reaches a threshold where the 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 some cases, any loss in value of a resource caused by predators could be financially burdensome to some people. In addition, establishing a threshold would be difficult or inappropriate to apply to human health and safety situations. For example, aircraft striking predators could lead to property damage and could threaten passenger safety if a catastrophic failure of the aircraft occurred because of the strike. Therefore, addressing the threats of wildlife strikes prior to an actual strike occurring would be appropriate.

Short Term Eradication and Long Term Population Suppression

An eradication alternative would direct all WS' program efforts toward total long-term elimination of predator populations wherever a person initiated a cooperative program with WS in North Dakota. Eradication of native wildlife species is not a desired population management goal of WS, the NDGFD, or other wildlife resource agencies. WS and the NDGFD did not consider eradication as a general strategy for managing predator damage because WS, the NDGFD, and other state and federal agencies with interest in, or jurisdiction over, wildlife oppose eradication of any native wildlife species and eradication is not acceptable to most people.

Suppression would direct WS' program efforts toward managed reduction of certain problem populations or groups. The NDGFD has the authority to regulate hunting seasons and tag quotas in the State to reduce wildlife populations. In addition, in areas where WS could attribute damage to localized populations of predators, WS could decide to implement local population suppression using the WS Decision Model. However, large-scale population suppression would not be realistic or practical to consider as the basis of the WS program. Problems with the concept of suppression would be similar to

those described above for eradication. Typically, WS would conduct activities on a very small portion of the sites or areas inhabited or frequented by predators in the State.

WS should use Lithium Chloride as an Aversive Agent

This alternative would require WS to use only lithium chloride to manage damage or threats of damage associated with predators. Researchers have evaluated lithium chloride as a taste aversion agent to condition coyotes to avoid livestock, especially sheep. Despite extensive research, the efficacy of this technique remains unproven to prevent livestock predation (Conover et al. 1977, Sterner and Shumake 1978, Burns 1980, Burns and Connolly 1980, Burns 1983, Horn 1983, Johnson 1984, Burns and Connolly 1985). Results of studies evaluating lithium chloride as a taste aversion agent to prevent coyote predation have reported varying results. Some studies report success using lithium chloride (Gustavson et al. 1974, Ellins and Martin 1981, Gustavson et al. 1982, Forthman-Quick et al. 1985a, Forthman-Quick et al. 1985b), while other studies have shown lithium chloride to be ineffective, especially in field situations (Conover et al. 1977, Burns 1980, Bourne and Dorrance 1982, Burns 1983, Burns and Connolly 1985). The United States General Accounting Office (2001) reported “...while the coyotes learned not to eat lambs, they still killed them”. In addition, lithium chloride is currently not registered for use with the EPA to prevent predation. Therefore, at the time this EA was developed, products containing lithium chloride were not available to prevent predation. If a product containing lithium chloride becomes available to manage damage and if the product is effective in reducing predation rates, WS could consider the use of the lithium chloride as a method available that could be used to managing damage. Managing damage, other than livestock predation by coyotes, would not be possible using just lithium chloride. To be effective target animals must ingest the lithium chloride, which would not resolve other damage situations (e.g., disease threats, property damage). Therefore, WS and the NDGFD did not consider this alternative in detail.

3.3 STANDARD OPERATING PROCEDURES FOR PREDATOR DAMAGE MANAGEMENT

SOPs are formalized procedures that serve as operational plans to ensure that people employ tasks and procedures with consistency (Reidinger and Miller 2013). SOPs provide quality assurance and improve the safety, selectivity, and efficacy of activities intended to resolve animal damage. The WS program in North Dakota uses many such SOPs. Under the appropriate alternatives, WS’ personnel would incorporate those SOPs into activities when addressing predator damage and threats in the State. Most SOPs abate specific issues while some are more general and relate to the overall program.

Some key SOPs pertinent to resolving predator damage in the State include the following:

- ◆ WS’ employees would consistently use and apply the WS Decision Model when addressing predator damage to identify effective strategies to managing damage and the potential effects. Decisions made using the model would be in accordance with WS’ directives (see WS Directive 1.101) and SOPs described in this EA.
- ◆ WS personnel would comply with applicable federal, state, and local laws and regulations (see WS Directive 2.201).
- ◆ WS’ personnel would follow EPA-approved label directions for all pesticide use (see WS Directive 2.401). The intent of the registration process for chemical pesticides is to assure minimal adverse effects occur to the environment when people use the chemicals in accordance with label directions.
- ◆ WS’ employees would use approved immobilizing drugs and euthanasia chemicals according

to the United States Drug Enforcement Administration, United States Food and Drug Administration, and WS' directives and procedures (see WS Directive 2.430).

- ◆ WS' employees would follow approved procedures outlined in the WS' Field Manual for the Operational Use of Immobilizing and Euthanizing Drugs (Johnson et al. 2001).
- ◆ WS' employees that use controlled substances would receive training to use each material and would receive certification to use controlled substances.
- ◆ WS' employees who use pesticides and controlled substances would participate in State-approved continuing education to keep current of developments and maintain their certifications (see WS Directive 2.401).
- ◆ Pesticide and controlled substance use, storage, and disposal would conform to label instructions and other applicable laws and regulations, and Executive Order 12898.
- ◆ WS would provide Material Safety Data Sheets for pesticides and controlled substances to personnel involved with specific damage management activities.
- ◆ All personnel who use firearms would receive training according to WS' Directives (see WS Directive 2.615).
- ◆ WS' employees participating in any aspect of aerial operations would receive training and/or would receive certification in their role and responsibilities during the operations. All WS' personnel would follow the policies and directives set forth in WS Directive 2.620; WS' Aviation Operations Manual; WS' Aviation Safety Manual and its amendments; Title 14 CFR; and Federal Aviation Regulations, Part 43, 61, 91, 119, 133, 135, and 137.
- ◆ WS' personnel would consider the use of non-lethal methods prior to the use of lethal methods when managing predator damage (see WS Directive 2.101).
- ◆ The removal of predators by WS would only occur when authorized by the NDGFD, when applicable, and only at levels authorized.
- ◆ WS' personnel would direct management actions toward localized populations, individuals, or groups of predators. WS' personnel would not conduct generalized population suppression across North Dakota, or even across major portions of the State.
- ◆ WS' personnel would release non-target animals live-captured in traps unless an employee determined that the animal would not survive and/or that releasing the animal could not occur safely.
- ◆ The use of all traps, cable devices, and other capture devices by WS' personnel would adhere to WS Directive 2.450.

3.4 ADDITIONAL STANDARD OPERATING PROCEDURES SPECIFIC TO THE ISSUES

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

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

- ◆ The WS program in North Dakota would document the lethal removal of predators annually. In cooperation with the NDGFD, the lethal removal of predators by WS would be monitored to evaluate effects to the statewide populations of predators.
- ◆ WS would only target those individuals or groups of animals identified as causing damage or posing a threat of damage, including threats to human safety.
- ◆ WS' personnel would use the WS Decision Model, designed to identify the most appropriate damage management strategies and their impacts, to determine strategies for resolving predator damage.
- ◆ The WS program would monitor activities under the selected alternative to ensure activities continued to occur pursuant to the selected alternative. However, under the no involvement by WS alternative, no monitoring would occur by WS.
- ◆ WS' personnel would give preference to non-lethal methods, when practical and effective.

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

- ◆ WS' personnel would have experience and receive training to select the most appropriate method(s) to address target animals and avoiding risks to non-target species.
- ◆ WS personnel work with research programs to continue to improve the selectivity and effectiveness of management devices.
- ◆ When conducting removal operations via shooting, identification of the target would occur prior to application.
- ◆ As appropriate, WS' personnel would use suppressed firearms to minimize the noise associated with the discharge of a firearm.
- ◆ Personnel would use lures, trap placements, and capture devices that personnel would place strategically at locations likely to capture a target animals and minimize the potential of non-target animal captures.
- ◆ To minimize the capture of non-target species that weigh less than the target species, WS commonly uses pan tension devices on foothold traps and foot snares.
- ◆ In accordance with the regulations of the NDGFD, all cable devices would be equipped with breakaway mechanism designed to open and release when a larger animal, such as deer, antelope, or livestock, exerts tension on the cable.
- ◆ When using carcasses to attract predators, traps and snares would not be set within 30 feet of exposed carcasses to prevent the capture of scavenging birds, such as bald eagles and golden eagles.
- ◆ Personnel would release any non-target animals live-captured in cage traps, foothold traps, or any other restraining device whenever it was possible and safe to do so.

- ◆ WS' personnel would check methods in accordance with WS Directive 2.210 and WS Directive 2.450. Personnel would directly monitor some live-capture methods (*e.g.*, immobilizing drugs administered through a dart gun), which ensures that personnel could avoid or release non-target species quickly, if captured. In most cases, WS' personnel would check other live-traps (*e.g.*, cage traps, foothold traps, restraining cables), which do not require direct monitoring, in accordance with North Dakota laws and regulations. Checking traps frequently would help ensure that personnel could release live-captured non-target species in a timely manner.
- ◆ Pilots conducting aerial operations would abide by the WS Aviation Operations and Safety Manual and Federal Aviation Regulations. Non-target wildlife would not be pursued and when seen would be avoided, whenever possible.
- ◆ Personnel would dispose of the carcasses retrieved in accordance with WS Directive 2.515.
- ◆ WS has consulted with the USFWS to evaluate activities to resolve predator damage and threats to ensure the protection of T&E species. Personnel would abide by all Reasonable and Prudent Measures and Alternatives and Terms and Conditions of the most current Biological Opinion issued by the USFWS regarding T&E species listed in North Dakota, specifically the gray wolf (*Canis lupus*) (see Appendix C).
- ◆ WS would monitor activities conducted under the selected alternative, if activities were determined to have no significant impact on the environment and an EIS was not required, to ensure those activities do not negatively affect non-target species.
- ◆ WS' personnel would review all projects proposed for implementation for potential to take¹⁵ bald eagles in accordance with the provisions of the Bald and Golden Eagle Protection Act. If WS' personnel identify potential risks of take, WS would work with the USFWS on measures to reduce risks and the need for a non-purposeful take permit.
- To minimize possible impacts to bald eagles, WS has adopted the Reasonable and Prudent Measures originally identified in the USFWS Biological Opinion as an SOP:
 - **Tier 1 - Areas without evidence of eagles attracted to M-44 draw stations or the carcasses of animals taken with M-44 devices:**
 1. WS will continue to use M-44s consistent with the EPA product label and the EPA 26 Use Restrictions.
 2. If eagles are attracted to M-44 draw stations that could result in the inadvertent take of an eagle, WS will implement the measures identified in Tier 2 or Tier 3.
 - **Tier 2 - Areas with evidence of a single eagle attracted to M-44 draw stations or the carcasses of animals taken with M-44 devices:**
 1. WS will maintain a 100-foot space between baits and M-44 devices.

¹⁵The Bald and Golden Eagle Protection Act defines "take" as "*pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb*". Disturb is defined as any activity that can result in injury to an eagle, or cause nest abandonment or decrease in productivity by impacting breeding, feeding, or sheltering behavior.

2. When found, WS' employees will place the carcasses of coyotes in heavy brush, within stands of trees, or remove the carcass from the site.
 3. Upon observing more than one eagle feeding on M-44 draw stations or the carcasses of animals taken with M-44 devices, WS will implement the measures identified in Tier 3.
- **Tier 3 - Areas with evidence that multiple eagles are attracted to M-44 draw stations or the carcasses of animals taken with M-44 devices (i.e., eagles feeding at the M-44 site; eagles on the ground or perched in trees within 0.25 mile of the draw station; or other behavior indicating eagles have discovered the draw station as determined by WS or the USFWS.**
1. Baits will be concealed in perforated buckets or buckets fitted with a vent tube to allow the bait's odor to dispense. WS' personnel will bury the buckets or leave the buckets above ground with a minimum 30-foot spacing between the M-44 devices and the bait.
 2. If WS' personnel use animal carcasses as a "draw station", they will place the carcasses in heavy brush or within stands of trees to discourage eagles from landing at the site and feeding. WS' personnel will place M-44 devices at least 100 feet from the bait.
 3. When found, WS' employees will place the carcasses of coyotes in heavy brush, within stands of trees, or remove the carcass from the site.

Issue 3 - Effects of Damage Management Methods on Human Safety

- ◆ WS' personnel would conduct damage management activities professionally and in the safest manner possible. Whenever possible, personnel would conduct damage management activities away from areas of high human activity. If this were not possible, then personnel would conduct activities during periods when human activity was low (e.g., early morning), whenever possible.
- ◆ WS' personnel would use the WS' Decision Model (see WS Directive 2.201) when selecting methods to use and/or recommend (see WS Directive 2.101), including consideration for the safety of people and employees (see WS Directive 2.210, WS Directive 2.601, WS Directive 2.605, WS Directive 2.615, WS Directive 2.620, WS Directive 2.625).
- ◆ WS' personnel would conduct shooting during times when public activity and access to the control areas were restricted, whenever possible. Personnel involved in shooting operations would receive training in the proper and safe application of this method.
- ◆ All personnel employing chemical methods would receive proper training and certification 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 Directive 2.401, WS Directive 2.405, WS Directive 2.430, and WS Directive 2.465 outline WS' use of chemicals and the training requirements to use those chemicals.
- ◆ All chemical methods used by WS or recommended by WS would be registered with the EPA, the United States Drug Enforcement Administration, the United States Food and Drug Administration, and/or the NDAA, as appropriate.

- ◆ WS' personnel would receive training to properly place and set M-44 devices. Only those personnel who receive the appropriate applicator certification from the NDDA to use sodium cyanide would place and set M-44 devices. Personnel would use M-44 devices in accordance with NDDA and EPA regulations and label restrictions, including WS Directive 2.415.
- ◆ WS' personnel would place conspicuous, bilingual warning signs alerting people to the presence of traps, snares, and M-44 devices at major access points to the property where personnel use those methods.
- ◆ WS' personnel would dispose of carcasses retrieved after damage management activities in accordance with WS Directive 2.515.

Issue 4 – Humaneness and Animal Welfare Concerns of Methods

- ◆ WS' personnel would receive training in the latest and most humane devices/methods for removing target animals causing damage.
- ◆ WS' personnel would check methods in accordance with WS Directive 2.210 and WS Directive 2.450. Personnel would directly monitor some live-capture methods (*e.g.*, immobilizing drugs administered through a dart gun), which ensures that personnel could avoid or release non-target species quickly, if captured. In most cases, WS' personnel would check other live-traps (*e.g.*, cage traps, foothold traps, restraining cables), which do not require direct monitoring in accordance with North Dakota laws and regulations. Checking traps frequently would help ensure that personnel could release live-captured non-target species in a timely manner.
- ◆ When deemed appropriate using the WS Decision Model, WS' use of lethal methods would comply with WS' directives (*e.g.*, see WS Directive 2.401, WS Directive 2.430, 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.
- ◆ WS' personnel would consider the use of non-lethal methods prior to the use of lethal methods when managing predator damage.

CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

Chapter 4 provides information needed for making informed decisions when 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 that alternative relates to the identified issues.

Irreversible and Irretrievable Commitments of Resources

Other than relatively minor uses of fuels for motor vehicles and electricity for office operations, no irreversible or irretrievable commitments of resources result from the WS program.

Cumulative and Unavoidable Impacts

Chapter 4 analyzes the environmental consequences of each alternative as that alternative relates to the identified issues in comparison with Alternative 1 to determine if the potential impacts are greater, lesser, or similar. The analyses discuss the cumulative effects in relationship to each of the alternatives analyzed, with emphasis on potential cumulative effects from methods employed, and including summary analyses of potential cumulative impacts to target and non-target species, including T&E species.

4.1 EVALUATION OF SIGNIFICANCE

Chapter 4 evaluates the direct, indirect, and cumulative impacts associated with the alternatives under each of the issues. The NEPA describe the elements that determine whether an impact is “*significant*”. Significance is dependent upon the context and intensity of the action. WS and the NDGFD considered the following factors when reviewing the context and intensity of the alternatives:

Magnitude of the Impact

The magnitude of the impact is based on the size, number, or relative amount of impact (intensity). For example, the analysis that occurs in Chapter 4 measures the number of individual animals lethally removed in relation to the abundance of that animal to determine the magnitude of impact to the populations from the use of lethal methods. Magnitude may be determined either quantitatively or qualitatively. Determinations based on population estimates, allowable harvest levels, and actual harvest data would be quantitative. Determinations based on population trends and harvest trend data, when available, would be qualitative

Duration and Frequency of the Action

The duration and frequency of the impact relates to factors, such as, is the impact temporary, seasonal, or ongoing throughout the year (intensity). The duration and frequency of activities associated with the alternatives would be highly variable. Abiotic and biotic factors affecting predator behavior would affect the duration and frequency of activities conducted by WS under the alternatives. Although activities may involve programs of long duration, the frequency of individual activities within the program may be highly variable depending upon spatial, temporal, and biotic factors affecting the behavior of the predators that are causing damage. For instance, the lethal removal of several predators that continue to depredate may be very infrequent if non-lethal techniques prevent additional predators from habituating to the area. Projects involving damage management activities at individual sites are generally of short duration but may happen frequently at different sites.

Likelihood of the Impact

This factor can relate to the likelihood that a particular damage management action will be needed, and to the likelihood that an impact may occur because of a damage management action. For example, the likelihood that an abundant predator, such as a coyote, may be managed (harassment or lethal removal) to reduce depredations may be relatively high, but the need to harass or remove other less abundant predators may be much lower. Likewise, although some impacts on non-target species may be theoretically possible, the likelihood that the impact would occur may be negligible or nonexistent because of SOPs used by WS.

Geographic Extent

Activities conducted under the alternatives could occur anywhere in North Dakota where damage management assistance has been requested, agreements for such actions are in place, and action is warranted, as determined by the WS Decision Model (Slate et al. 1992). North Dakota encompasses about 69,001 mi² of land area. However, the WS program only has agreements to conduct activities associated with predators on a small portion of land in the state and not all properties where assistance is requested may need assistance in any given year. Additionally, WS generally only conducts activities on a small portion of the land acres allowed under a MOU, work initiation document, or another comparable document. For example, a landowner may allow WS to conduct activities on the 100 acres they own but WS' personnel might only conducted activities on 10 acres of the property.

4.2 ENVIRONMENTAL CONSEQUENCES FOR ISSUES ANALYZED IN DETAIL

This section analyzes the environmental consequences of each alternative in comparison to determine the extent of actual or potential impacts on the issues. Therefore, Alternative 1 serves as the baseline for the analysis and the comparison of expected impacts among the alternatives. The analysis also takes into consideration mandates, directives, and the procedures of WS and the NDGFD.

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

A common issue is whether damage management actions would adversely affect the populations of target predator species, especially when lethal methods were employed. The analysis for magnitude of impact from lethal removal can be determined either quantitatively or qualitatively. Quantitative determinations are based on population estimates, allowable harvest levels, and actual harvest data. Qualitative determinations are based on population trends and harvest trend data. Information on predator populations and trends are often derived from several sources, including published literature and harvest data.

Methods available to address predator damage or threats of damage in the State that would be available for use or recommendation under Alternative 1 (proposed action/no action alternative) and Alternative 3 (technical assistance only alternative) would either be lethal methods or non-lethal methods. Those same methods would also be available to other entities under Alternative 2 (use of non-lethal methods only by WS) and Alternative 4 (no involvement by WS alternative). Under Alternative 3, the WS program could recommend lethal and non-lethal methods as part of an integrated approach to resolving requests for assistance. Non-lethal methods that could be available would include, but would not be limited to, habitat behavior modification, pyrotechnics, visual deterrents, cage traps, foothold traps, padded foothold traps, foot snares, translocation, exclusionary devices, tracking dogs, decoy dogs, frightening devices, fladry, immobilizing drugs, and chemical repellents (see Appendix B for a complete list and description of potential methods).

Non-lethal methods that would be available under all of the alternatives can disperse or otherwise make an area unattractive to predators causing damage; thereby, reducing the presence of those predators at the site and potentially the immediate area around the site where non-lethal methods were employed. WS' personnel would give priority to non-lethal methods when addressing requests for assistance under Alternative 1, Alternative 2, and Alternative 3 (see WS Directive 2.101). However, WS' personnel would not necessarily employ or recommend non-lethal methods to resolve every request for assistance if deemed inappropriate by personnel using the WS Decision Model. For example, if a cooperater requesting assistance had already used non-lethal methods, WS would not likely recommend or continue to employ those particular methods since their use had already been proven ineffective in adequately resolving the damage or threat.

Many non-lethal methods would be used to exclude, harass, and disperse target wildlife from areas where damage or threats were occurring. When effective, non-lethal methods would disperse or exclude predators from the area resulting in a reduction in the presence of those predators at the site where those methods were employed. However, predators responsible for causing damage or threats could be dispersed to other areas with minimal impact on those species' populations. 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 would generally be regarded as having minimal impacts on overall populations of wildlife since individuals of those species were unharmed. The use of non-lethal methods would not have adverse impacts on predator populations in State under any of the alternatives.

The continued use of many non-lethal methods can often lead to the habituation of predators to those methods, which can decrease the effectiveness of those methods. For any management methods employed, the proper timing would be essential in effectively dispersing those predators causing damage. Employing methods soon after damage begins or soon after threats were identified would increase the likelihood that those damage management activities would achieve success in addressing damage. Therefore, the coordination and timing of methods would be necessary to be effective in achieving expedient resolution of predator damage.

Lethal methods would also be available for use under all the alternatives. Lethal methods that would be available to address predator damage include live-capture followed by euthanasia, firearms, shooting from aircraft, calling and shooting, neck snares, body-gripping traps, fumigants (coyotes, red fox, striped skunks only), cable devices, sodium cyanide (coyotes, fox, feral dogs only), and the recommendation of harvest during hunting and/or trapping, where appropriate.

When live-captured target animals were to be euthanized under Alternative 1, euthanasia would occur pursuant to WS Directive 2.505 and WS Directive 2.430. Under alternative 3, the WS program would recommend the use of methods to euthanize live-captured or restrained target animals in accordance with WS Directive 2.505. No assistance would be provided by the WS program under Alternative 4 and only non-lethal methods would be recommended or employed by WS under Alternative 2; however, many of those methods available to euthanize live-captured or restrained animals would continue to be available for use by other entities under Alternative 2 and Alternative 4.

The use of lethal methods by any entity could result in local population reductions in the area where damage or threats were occurring since target individuals would be removed from the population. Lethal methods could be employed or recommended to remove predators that have been identified as causing damage or posing a threat to human safety. Therefore, the use of lethal methods could result in local reductions of predators in the area where damage or threats were occurring. The number of predators removed from the population annually by WS using lethal methods under Alternative 1 would be dependent on the number of requests for assistance received, the number of predators involved with the associated damage or threat, and the efficacy of methods employed. The number of predators that could be removed by other entities under Alternative 2, Alternative 3, and Alternative 4 would be unknown but would likely be similar to the removal that could occur under Alternative 1.

Most lethal methods would be employed to reduce the number of predators present at a location since a reduction in the number of predators at a location could lead to a reduction in damage, which would be applicable whether using lethal or non-lethal methods. The intent of non-lethal methods would be to harass, exclude, or otherwise make an area unattractive to predators, which disperses those predators to other areas leading to a reduction in damage at the location where those predators were dispersed. The

intent of using lethal methods would be similar to the objective trying to be achieved when using non-lethal methods, which would be to reduce the number of predators in the area where damage was occurring; thereby, reducing the damage occurring at that location.

Often of concern with the use of lethal methods is that predators that were lethally removed would only be replaced by other predators either during the application of those methods (*e.g.*, predators that relocate into the area) or by predators the following year (*e.g.*, increase in reproduction and survivability that could result from less competition). As stated previously, WS would not use lethal methods during direct operational assistance as population management tools over broad areas. Lethal methods would be employed under Alternative 1 to reduce the number of target animals present at a location where damage was occurring by targeting those animals causing damage or posing threats. The return of predators to areas where methods were previously employed does not indicate previous use of those methods were ineffective since the intent of those methods were to reduce the number of predators present at a site where predation was occurring or could occur at the time those methods were employed.

To adequately determine the magnitude of impacts in relation to predators and their populations, data and known cumulative lethal removal of predators was analyzed by the NDGFD. WS maintains ongoing contact with the NDGFD to ensure activities are within management objectives for those species. WS submits annual activity reports to the NDGFD to aid with their ongoing monitoring efforts.

The NDGFD has the authority to manage populations of resident wildlife species, with the exception of migratory birds and T&E species, as they determine is appropriate without oversight or control by federal agencies. Management direction for a given species can vary among states, and state management actions are not subject to compliance with the NEPA. Therefore, the status quo for the environment with respect to state-managed wildlife species is the management direction established by the states. Federal actions that are in accordance with state management have no effect on the status quo. Wildlife populations are typically dynamic and can fluctuate without harvest or control by people. Therefore, the status quo for wildlife populations is fluctuation, both within and among years, which may affect perceptions of the significance of the human impact on such populations.

Maintaining viable populations of all native species is a concern of the public and of biologists within state, tribal, and federal wildlife and land management agencies, including WS. The United States General Accounting Office (1990) analyzed the effects damage management activities conducted by the WS program on predators in the western United States and determined that WS' activities had no overall effect on predator populations. Several species' populations have steadily increased over the past several years due to the adaptability of those wildlife species to human-altered environments, and damage from those species has increased accordingly (International Association of Fish and Wildlife Agencies 2005). To evaluate the potential cumulative effects associated with implementing the alternatives, the magnitude associated with lethally removing predators to alleviate damage occur below for each alternative.

Alternative 1 - Continue the Current Adaptive Integrated Methods Approach to Managing Predator Damage (No Action/Proposed Action)

Under Alternative 1, WS would continue to provide both technical assistance and direct operational assistance to those persons requesting assistance with reducing damage and threats associated with predators in North Dakota. WS could employ those methods described in Appendix B in an adaptive approach that would integrate methods to reduce damage and threats associated with predators.

Non-lethal methods would be given preference when addressing requests for assistance (see 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 had already used non-lethal methods, WS would not likely recommend or continue to employ those particular methods since their use had already been proven ineffective in adequately resolving the damage or threat.

Many non-lethal methods could be used to excluded, harass, and disperse target wildlife from areas where damage or threats were occurring. When effective, non-lethal methods would disperse predators from the area resulting in a reduction in the presence of those predators at the site where those methods were employed. However, predators responsible for causing damage or threats would be dispersed 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 not lethally removed. The use of non-lethal methods would not likely have adverse impacts on predator populations in North Dakota under any of the alternatives.

Lethal methods would also be available for use by WS and/or other entities under all of the alternatives. The use of lethal methods could result in local population reductions in the area where damage or threats were occurring since predators would be removed from the population. Under Alternative 1, the number of predators removed from the population by WS using lethal methods would be dependent on the number of requests for assistance received, the number of predators involved with the associated damage or threat, and the efficacy of methods employed. Table 4.1 shows the number of predators lethally removed each year by the WS program from FY 2009 through FY 2014 to alleviate damage or threats of damage.

The WS program and the NDGFD would monitor activities by comparing the number of animals killed from a species with the overall populations or trends in a species' population to assure the magnitude of removal was maintained below the level that would cause undesired adverse effects to the viability the populations. Collins and Kays (2011) stated, "...*careful monitoring and sustainable harvest policies can be effective at preventing population declines...*". Therefore, the monitoring that WS and the NDGFD would conduct can prevent undesired adverse effects on a species' population. As indicated previously, most requests for assistance received by the WS program in North Dakota are associated with coyotes, red fox, raccoons, striped skunks, and badgers. In addition to those species, WS occasionally receives requests for assistance or anticipates receiving requests for assistance to manage damage and threats of damage associated with bobcats, mountain lions, feral cats, feral dogs, fishers, American marten, mink, and long-tailed weasels.

Table 4.1 – WS' lethal removal of predators in North Dakota, FY 2009 – FY 2014[†]

SPECIES	2009	2010	2011	2012	2013	2014	Total	Mean
Coyote	2,615	2,526	3,332	3,005	4,189	2,350	18,017	3,003
Red Fox	53	51	64	98	36	43	345	58
Raccoon	44	33	45	90	29	25	266	44
Striped Skunk	49	27	22	25	12	12	147	25
Badger	16	21	19	18	14	8	96	16
Feral Dog	0	1	0	2	9	2	14	2.3
Mink	0	0	4	3	1	1	9	1.5
Bobcat	0	2	0	4	1	0	7	1.2
Fisher	0	4	0	1	0	0	5	0.8
Feral Cat	0	0	0	0	1	4	5	0.8
Long-tailed Weasel	0	0	0	1	0	0	1	0.2

American Marten	0	0	0	0	2	0	2	0.3
Mountain Lion	0	0	0	0	1	0	1	0.2

†Data includes intentional and unintentional removal of the species by WS

The potential impacts on the populations of target predator species from the implementation of this alternative are analyzed in the following sections.

BADGER, COYOTE, RED FOX, RACCOON, AND STRIPED SKUNK POPULATION IMPACT ANALYSIS

As stated previously, most requests for assistance received by the WS program in North Dakota are associated with coyotes, red fox, raccoons, striped skunks, and badgers. Except for federally listed T&E species, the NDGFD has management responsibility for resident wildlife species (see NDCC 20.1-01-02), which include furbearers (see NDCC 20.1-07). Under this alternative, WS would continue to coordinate activities to reduce and/or prevent predator damage in the State with the NDGFD, which would ensure the NDGFD had the opportunity to incorporate any activities WS’ conducts into population objectives established for wildlife populations in the State. As part of those coordinated activities, WS would submit annual activity reports to the NDGFD to aid with their ongoing monitoring efforts. As part of those monitoring efforts, the NDGFD completed an analysis of the annual removal of badgers, coyotes, red fox, raccoons, and striped skunks by WS from FY 2005 through FY 2014 to determine whether or not WS’ annual removal of those species are having a negative effect on the populations of those species (see Appendix D). The analysis conducted by the NDGFD included the cumulative removal by WS (*i.e.*, intentional and unintentional removal) between FY 2005 and FY 2014.

Of the predator species addressed by WS annually from FY 2009 through FY 2014, the three species with the highest annual lethal removal by WS are coyotes, red fox, and raccoons (see Table 4.1). Coyotes, red fox, and raccoons occur statewide in North Dakota, although the distribution and abundance of red fox have varied historically (Seabloom et al. 2011). The NDGFD classifies coyotes, red fox, and raccoons as “*furbearers*” in the State and allows people to harvest those species throughout the year using all legal methods, except cable devices, which people can only utilize from late November through mid-March (Dalrymple 2014). In addition, people can use cable devices to target raccoons within 50 feet of water from mid-March to the end of April (Dalrymple 2014). The NDGFD places no limit on the number of those species that people can harvest in the State.

Based on their analysis of WS’ activities associated with coyotes, red fox, and raccoons (see Appendix D), the NDGFD concluded:

- The proportion of the range for each of the three species affected by WS’ activities is negligible.
- The annual removal of coyotes by WS did not impacted coyote population trends, but removal may instead be a reliable index of the statewide coyote population.
- The numbers of red fox and raccoon removed annually by WS had no impact on the populations of either of those species.

The NDGFD also considers badgers to be a “*furbearer*” species in the State. Striped skunks are an unprotected species in State. Like coyotes, red fox, and raccoons, people can harvest badgers and striped skunks throughout the year with no limit on the number that people can harvest. People can harvest badgers using all legal methods, except cable devices, which people can only utilize from late November through mid-March (Dalrymple 2014). People can harvest skunks throughout the year using hunting methods.

The NDGFD analyzed the annual lethal removal of badgers and striped skunks by WS from FY 2005 through FY 2014. The NDGFD stated, “*these species...are considered common or abundant in their available habitats...*” (see Appendix D). The NDGFD analysis determined the removal by WS of badgers and striped skunk is “*minuscule and of no concern to their population sustainability or management*” (see Appendix D).

The WS program in North Dakota expects the annual lethal removal of badgers, coyotes, red fox, raccoons, and striped skunks under Alternative 1 to remain similar to previous activities. The WS program does not anticipate the lethal removal of those species to increase substantially. In addition, the NDGFD would continue to monitor activities conducted by WS to ensure activities occurred within management objectives established by the NDGFD. Based on the limited removal that could occur by WS and the oversight by the NDGFD, WS’ removal of those species annually would have no effect on the ability of those persons interested to harvest those species.

ADDITIONAL TARGET SPECIES

In addition to badgers, coyotes, red fox, raccoons, and striped skunks, WS has addressed limited numbers of bobcats, mountain lions, feral cats, feral dogs, fishers, American marten, mink, and long-tailed weasels previously or WS anticipates addressing a limited number of those species under Alternative 1. Requests for assistance associated with those species would often occur infrequently or would involve only a few individuals. Under Alternative 1, WS could receive requests for assistance to use lethal methods to remove those species when non-lethal methods were ineffective or were determined to be inappropriate using the WS Decision model.

WS does not expect the annual removal of those species by the program to occur at any level that would adversely affect populations of those species. Removal would be limited to those individuals deemed causing damage or posing a threat. The NDGFD analyzed the annual lethal removal of bobcats, fishers, mink, and mountain lions by WS from FY 2005 through FY 2014. The NDGFD stated, “*All of these species of furbearers...are considered common or abundant in their available habitats...*” (see Appendix D). The NDGFD analysis determined “[t]he amount of removal conducted by WS...is *minuscule and of no concern to their population sustainability or management*” (see Appendix D). WS would continue to provide the NDGFD with annual activity reports, which would allow the NDGFD to consider the cumulative removal of target species by WS.

The NDGFD considers bobcats, fishers, mink, and mountain lions to be “*furbearers*” in the State with annual hunting and/or trapping seasons. During the hunting and trapping seasons for bobcats and mink, the NDGFD places no limits on the number that people can harvest during the open seasons. The NDGFD allows trappers to harvest one fisher in the State annually during the trapping season. Similarly, the NDGFD allows hunters to harvest one mountain lion during the length of the hunting season with some hunting zones having quotas on the number of mountain lions that people can harvest cumulatively. Although some evidence suggests human harvest of mountain lions may have an additive effect on mountain lion mortality (Cooley et al. 2009, Wielgus et al. 2013, Robinson et al. 2014), the NDGFD continues to monitor the mountain lion population in the State closely, including the annual harvest of mountain lions and sources of other mortality (NDGFD 2016c).

In Appendix D, the NDGFD stated, “*Over the past 10 years, WS has removed 1 mountain lion...at the request of [the NDGFD]. This particular mountain lion had been depredating domestic calves. The removal of 1 mountain lion over a 10-year period did not have a negative impact on the population sustainability and management of mountain lions in North Dakota.*” If the WS program in North Dakota implements Alternative 1, WS expects the need to lethal remove a mountain lion to occur infrequently

similar to previous activities where WS removed one mountain lion over a 10-year period. WS does not expect the annual removal of mountain lions to occur at any level that would adversely affect the population in North Dakota. Removal would be limited to those individuals deemed causing damage or posing a threat and would likely only occur after the NDGFD requested WS remove the target mountain lion. Therefore, any removal of mountain lions by WS would occur within the management objectives of the NDGFD for the statewide mountain lion population.

The NDGFD also considers long-tailed weasels to be a “*furbearer*” in the State and allows people to harvest weasels during annual hunting and trapping seasons. During the length of the hunting and trapping season for long-tailed weasels, the NDGFD places no limit on the number of weasels people can harvest. Of the three species of weasels found in North Dakota, the long-tailed weasel is the most common. Between FY 2009 and FY 2014, the WS program in the State has lethally removed one long-tailed weasel to alleviate damage. Based on the limit removal that has occurred and could occur, the potential annual removal of long-tailed weasels by would not reach a magnitude where adverse effects would occur. The WS program in North Dakota expects the annual lethal removal of long-tailed weasels under Alternative 1 to continue to be infrequent and involve less than five weasels annually.

The NDGFD also classifies American marten as a “*furbearer*” in North Dakota; however, there is no open season for trapping or hunting marten in the State. The marten has a limited distribution in North Dakota with reported occurrences in Bottineau, Pembina, and Rolette Counties (Seabloom et al. 2011). At the request of the NDGFD, WS lethally removed two marten in the State during FY 2013. WS does not anticipate the cumulative removal of five marten over any ten-year period, which would result in minimal effects on the local and statewide population in North Dakota.

The WS program in North Dakota could occasionally receive requests for assistance associated with feral and free-ranging dogs and cats¹⁶. When receiving requests for assistance associated with feral and free-ranging dogs, the WS program in North Dakota would follow WS Directive 2.340 and the state-specific policy that addresses dog depredations:

- Within suburban and urban areas, WS would refer all requests for assistance associated with feral and free-ranging dogs to the local animal control authorities.
- In rural areas, WS would only assist with feral dog issues at the request of both the local law enforcement and the affected landowner. Depending on the outcome of the WS Decision Model, WS would employ either non-lethal or lethal methods to alleviate damage or threats of damage associated with feral dogs.

Between FY 2009 and FY 2014, the WS program in North Dakota has lethally removed an average of two feral dogs per year, including the unintentional removal of feral dogs during damage management activities targeting other animals. WS’ personnel also live-captured one feral dog intentionally and four dogs unintentionally between FY 2009 and FY 2014. WS’ personnel released those live-captured feral dogs unharmed. Based on previous requests for assistance and in anticipation of receiving additional requests for assistance, WS could lethally remove up to 10 feral dogs per year under Alternative 1. WS could also remove feral dogs unintentionally during other damage management activities; however, WS does not anticipate the cumulative lethal removal of feral dogs to exceed 10 dogs annually. WS’ limited lethal removal of feral dogs would have minimal effects on local or statewide populations in North Dakota. Any damage management activities involving the use of lethal or non-lethal methods by WS would be restricted to isolated individual sites.

¹⁶The NDGFD does not manage or regulate feral or free-ranging dogs and cats.

From FY 2009 through FY 2014, the WS program in North Dakota lethally removed four feral cats intentionally to alleviate damage. In addition, WS' personnel lethally removed one feral cat unintentionally during FY 2013 while targeting other animals. WS also unintentionally live-captured four feral cats in the State between FY 2009 and FY 2014 but released those cats unharmed. Requests for assistance received by WS involving feral cats have primarily been associated with human safety threats that cats can pose and damage to property.

In some cases, WS would employ live-capture methods to alleviate damage or threats of damage associated with feral cats. Once live-captured, WS could transfer custody of the cats to a local animal control facility. After relinquishing the feral or free-ranging cats to a local animal control facility, the care and the final disposition of the cat would be the responsibility of the animal control facility. WS may also receive requests to remove feral cats lethally to alleviate damage or threats. In anticipation of WS receiving requests to remove feral cats lethally, WS could remove up to 10 feral cats annually to address requests for assistance. WS could also remove feral cats unintentionally during other damage management activities; however, WS does not anticipate the cumulative lethal removal of feral cats to exceed 10 cats annually.

The WS program in North Dakota expects the annual lethal removal bobcats, mountain lions, feral cats, feral dogs, fishers, American marten, mink, and long-tailed weasels under Alternative 1 to remain similar to previous activities. The WS program does not anticipate the lethal removal of those species to increase substantially. In addition, the NDGFD would continue to monitor activities conducted by WS to ensure activities occurred within management objectives established by the NDGFD. Based on the limited removal proposed by WS and the oversight by the NDGFD, WS' removal of those species annually would have no effect on the ability of those persons interested to harvest those species.

EFFECTS ON THE PUBLIC'S AESTHETIC ENJOYMENT OF PREDATORS

A concern expressed by some people is WS' activities would result in the loss of aesthetic benefits of animals to the public, resource owners, or neighboring residents. People generally regard animals as providing economic, recreational, and aesthetic benefits (Decker and Goff 1987), and the mere knowledge that animals exist 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 likely started when people began domesticating animals. The public today share a similar bond with animals and/or wildlife in general and in modern societies, a large percentage of households have indoor or outdoor pets. However, some people may consider individual wild animals as "*pets*" or exhibit affection toward those animals, especially people who enjoy viewing animals. Therefore, the public reaction can be variable and mixed to animal damage management because there are numerous philosophical, aesthetic, and personal attitudes, values, and opinions about the best ways to manage conflicts/problems between people and animals.

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

Indirect benefits or indirect exercised values arise without the user being in direct contact with the animal and originate from experiences, such as looking at photographs and films of animals, reading about animals, or benefiting from activities or contributions of animals (*e.g.*, 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 animals vary considerably. Some people believe that WS should capture and translocate all animals to another area to alleviate damage or threats those animals pose. In some cases, people directly affected by animals strongly support removal. Individuals not directly affected by the harm or damage may be supportive, neutral, or totally opposed to any removal of animals from specific locations or sites. Some people totally opposed to animal damage management want WS to teach tolerance for damage and threats caused by animals, and that people should never kill animals. Some of the people who oppose removal of animals do so because of human-affectionate bonds with individual animals. Those human-affectionate bonds are similar to attitudes of a pet owner and result in aesthetic enjoyment.

In some cases, the presence of overabundant mammal species offends people, such as raccoons, coyotes, or feral species, such as cats or dogs. To such people, those species represent pests that are nuisances, which upset the natural order in ecosystems, and are carriers of diseases transmissible to people or other animals. In those situations, the presence of overabundant species can diminish their overall enjoyment of other animals by what they view as a destructive presence of such species. They are offended because they feel that those species proliferate in such numbers and appear to remain unbalanced.

In the wild, few animals in the United States have life spans approaching that of people. Mortality is high among wildlife populations and specific individuals among a species may experience death early in life. Mortality in wildlife populations is a natural occurrence and people who form affectionate bonds with animals experience loss of those animals over time in most instances. A number of professionals in the field of psychology have studied human behavior in response to attachment to pet animals (Gerwolls and Labott 1994, Marks et al. 1994, Zasloff 1996, Ross and Baron-Sorensen 1998, Archer 1999, Meyers 2000). Similar observations are probably applicable to close bonds that could exist between people and wild animals. As observed by researchers in human behavior, normal human responses to loss of loved ones proceed through phases of shock or emotional numbness, sense of loss, grief, acceptance of the loss or what cannot be changed, healing, and acceptance and rebuilding which leads to resumption of normal lives (Lefrancois 1999). Those people who lose companion animals, or animals for which they may have developed a bond and affection, can proceed through the same phases as with the loss of human companions (Gerwolls and Labott 1994, Boyce 1998, Meyers 2000). However, they usually establish a bond with other individual animals after such losses. Although they may lose the sense of enjoyment and meaning from the association with those animals that die or are no longer accessible, they usually find a similar meaningfulness by establishing an association with new individual animals or through other relational activities (Weisman 1991). Through this process of coping with the loss and establishing new affectionate bonds, people may avoid compounding emotional effects resulting from such losses (Lefrancois 1999).

WS only conducts activities on properties where the landowner or property manager signs a MOU, work plan, work initiation document, or a similar document allowing WS' personnel to conduct activities and personnel would only target those animals identified as causing damage or posing a threat of damage. In addition, other individuals of the same species would likely continue to be present in the affected area and people would tend to establish new bonds with those remaining animals. In addition, human behavior processes usually result in individuals ultimately returning to normalcy after experiencing the loss of association with a wild animal that an entity removed from a specific location.

Even in the absence of any involvement by WS, other entities could conduct activities to alleviate damage or threats of damage. Since other entities could remove predators causing damage or posing a threat of damage, the involvement of WS in removing those predators would not likely be additive to the number of predators that could be removed in the absence of involvement by WS. In addition, activities that could occur under the alternatives by WS would occur on a relatively limited portion of the total area in North Dakota, and the portion of various predator species' populations removed would typically be low (see preceding discussion). In localized areas where WS removes predators, dispersal of predators from adjacent areas typically contributes to repopulation of the area within a few weeks to a year, depending on the level of predator removal and predator population levels in nearby areas. Those target species addressed in this EA are relatively abundant, but people may not commonly observe those species because many of the species are secretive and nocturnal. As discussed previously, the effects on target predator populations from damage management activities would be relatively low if WS implemented Alternative 1, and opportunities to view, hear, or see evidence of predators would still be available over the majority of land area of the State.

EFFECTS ON RECREATIONAL ACTIVITIES

Public opinion about the best ways to reduce conflicts between people and animals is highly variable, making the implementation and conduct of damage management programs extremely complex. Some people express concerns that proposed activities could interfere with their enjoyment of recreational activities associated with animals. Recreational activities can include consumptive activities, such as hunting and fishing and non-consumptive activities, such as wildlife viewing and wildlife photography. The mere knowledge that wildlife exists is a positive benefit to many people (Decker and Goff 1987). Recreational activities can also be an important component of the economy in North Dakota.

In 2006, the USFWS and the United States Department of Commerce (2006) found 279,000 people participated in wildlife-associated recreation in North Dakota, including people that participated in hunting, fishing, and wildlife watching. In total, people spent \$269 million on wildlife recreation in North Dakota during 2006 (USFWS and the United States Department of Commerce 2006)¹⁷.

If the WS program in North Dakota implemented an alternative where personnel provide direct assistance with managing damage associated with predators, WS' employees could use lethal and non-lethal methods to target those animals that personnel have identified as causing damage or posing a threat of damage. If the WS program in North Dakota implemented Alternative 1, WS' personnel could use lethal methods to remove predators from areas where damage or threats were occurring when they determined those methods to be appropriate using the WS Decision Model. WS' personnel would only target those individual animals identified as causing damage or posing a threat of damage after receiving a request for assistance. The WS program in North Dakota does not engage in the suppression of native wildlife populations nor conducts activities to eradicate any native wildlife species.

As discussed in Section 1.5, the NDGFD is responsible for managing resident wildlife species in the State, except those species considered threatened or endangered by the USFWS. The NDGFD mission "*...is to protect, conserve, and enhance fish and wildlife populations and their habitat for sustained public consumptive and nonconsumptive use*" (NDGFD 2016b). As discussed previously, the NDGFD has reviewed WS' activities to manage predator damage in the State and determined that the number of

¹⁷Although the USFWS and U.S. Department of Commerce (2011) conducted a similar survey in 2011, the report did not release data for North Dakota due to concerns expressed regarding the estimates for North Dakota (Southwick Associates 2013). However, the Southwick Associates (2013) report included data on the economic contributions from all hunting in North Dakota from the 2011 survey but expressed a need to use the data with caution.

individual animals that WS could remove annually would be of low magnitude and the proportion of a species range affected by WS' activities would be negligible.

Similarly, if the WS program implemented non-lethal methods to address damage associated with predators, those non-lethal methods are likely to disperse or exclude those animals from those areas where WS' personnel employed those methods. However, WS' personnel would not employ non-lethal methods over large geographical areas or apply those methods 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.

Based on the conclusions of the NDGFD, which is the agency responsible for managing wildlife in the State and whose mission is to maintain wildlife populations for sustained consumptive and non-consumptive use, the implementation of Alternative 1 by the WS program in North Dakota would not limit the ability of people to conduct recreational activities in the State. The WS program in North Dakota would document the lethal removal of predators annually. In cooperation with the NDGFD, WS would continue to monitor WS' activities to evaluate effects on the statewide populations of predators.

Alternative 2 – WS Would Address Predator Damage through an Adaptive Integrated Approach Using Only Non-lethal Methods

This alternative would require personnel from the WS program to use only non-lethal methods to resolve damage or threats of damage. WS' personnel would only employ those methods discussed in Appendix B that were non-lethal. No intentional lethal removal of predators would occur by WS. The use of lethal methods could continue under this alternative by other entities or by those persons experiencing damage by predators. The non-lethal methods used or recommended by WS under this alternative would be identical to those non-lethal methods identified in any of the alternatives. As discussed and evaluated previously, non-lethal methods generally have minimal impacts on overall populations of animals since those methods do not harm target species. Therefore, the use of non-lethal methods would not have adverse effects on predator populations in the State under any of the alternatives.

Those persons experiencing damage often employ non-lethal methods to reduce damage or threats prior to contacting the WS program. For example, some livestock producers already use non-lethal methods to reduce predation (NASS 2000, NASS 2001, NASS 2005, NASS 2006, NASS 2011, APHIS Veterinary Services 2008, APHIS Veterinary Services 2012, APHIS Veterinary Services 2015). The NASS (2005) and the APHIS Veterinary Services (2015) reported that North Dakota sheep producers used non-lethal methods to reduce predator damage, such as night penning, guard dogs, llamas, fencing, other nonlethal methods, donkeys, frequent checks, lamb shed, culling, frightening tactics, bedding change, carrion removal, and herding to reduce predation. The NASS (2011) also reported that North Dakota cattle producers used guard animals, culling, frequent checks, carcass removal, exclusion fencing, fright tactics, herding, night penning, and other non-lethal methods to reduce predation.

Mitchell et al. (2004) indicated that non-lethal methods to alleviate predation could be effective. However, Mitchell et al. (2004) and others, such as Knowlton et al. (1999), indicate that, although certain non-lethal methods have shown promise, further research is needed to determine their effectiveness and practicality. Non-lethal methods are an important part of the mix of current strategies used to meet the need for action; however, in some cases, the use of only non-lethal methods would not keep damage or threats of damage at a level that would be acceptable to some people. Andelt (1992) reported that about a third of sheep producers using guard dogs indicated that the use of dogs did not reduce their reliance on other predator control techniques or on predator control agencies. Furthermore, livestock losses could increase as coyotes become accustomed to non-lethal practices (Pfieffer and Goos 1982). Green et al. (1994) found that guard dogs decrease in effectiveness over time, possibly due to an increase in coyotes

and/or increase in predatory activities. Shivik (2006) provided a comparison of non-lethal tools for managing predation associated with carnivores, including the duration of effectiveness of those non-lethal tools. For example, Shivik (2006) noted that electronic guards would only be effective for 40 to 50 days when used to deter coyotes. When evaluating the effectiveness of fladry to exclude coyotes from livestock pastures in Michigan, Davidson-Nelson and Gehring (2010) found “...no long-term exclusion of coyotes from fladry-protected livestock pastures.” However, design modification may improve the effectiveness of fladry (Young et al. 2015). Fencing may be cost prohibitive (deCalesta and Cropsey 1978, Thompson 1979, Nass and Theade 1988).

Implementation of many non-lethal method recommendations would be the responsibility of resource managers. For example, many non-lethal methods available to alleviate damage or threats to livestock associated with coyotes, such as livestock management practices (e.g., night-penning, herding, carcass removal) and physical exclusion (e.g., predator-proof fencing), are not practical for implementation by WS’ personnel. Implementation of most non-lethal methods for livestock protection falls within the purview of the livestock producer (Knowlton et al. 1999). The continued use of many non-lethal methods can often lead to the habituation of predators to those methods, which can decrease the effectiveness of those methods. Therefore, those persons experiencing damage or threats of damage associated with predators may seek assistance with the use of available lethal methods.

Other entities could continue to use lethal methods under this alternative. If those non-lethal methods employed by the WS program did not reduce damage or threats of damage to levels acceptable to the requester, the requester could seek assistance from the NDGFD, the NDDA, other entities, or could conduct damage management activities on their own. In some cases, property owners or managers may misuse some methods or use some methods in excess of what was necessary, which could then become hazardous and pose threats to the safety of people and wildlife species. People have resorted to the illegal use of chemicals and methods to alleviate the damage that animals cause (e.g., see Allen et al. 1996, United States Department of Justice 2014, United States Department of Justice 2015).

The WS program could refer those persons experiencing damage or threats of damage to the NDGFD, the NDDA, and/or to other entities for information and implementation of lethal methods. Therefore, if other entities increased their efforts to manage damage caused by predators in proportion to those activities that the WS program would have conducted using lethal methods, the potential effects on target predator populations would be similar to Alternative 1.

Alternative 3 – Predator Damage Management by WS through Technical Assistance Only

Under a technical assistance only alternative, WS would recommend an integrated methods approach similar to Alternative 1; however, WS would not provide direct operational assistance under this alternative. Therefore, this alternative would place the immediate burden of resolving damage on the people requesting assistance. Using information that a requester provides or from a site visit by an employee, WS would recommend methods and techniques based on the application of the WS Decision Model. In some instances, information provided to the requester by WS could result in tolerance/acceptance of the situation. In other instances, WS would discuss and recommend damage management options.

When WS discussed damage management options with the person requesting assistance, WS could recommend and demonstrate for use both non-lethal and lethal methods legally available for use to alleviate predator damage. Those persons receiving technical assistance from WS could implement those methods recommended by WS, could employ other methods not recommended by WS, could seek assistance from other entities, or take no further action.

Despite WS not providing direct operational assistance to resolve damage and threats associated with predators, those people experiencing damage caused by predators could continue to alleviate damage by employing those methods legally available or by seeking assistance from other entities. Appendix B discusses the methods available for use in managing damage and threats associated with predators. Similar to Alternative 1, those methods described in Appendix B would be available to those persons experiencing damage or threats associated with predators in the State; however, immobilizing drugs, euthanasia chemicals, sodium cyanide (M-44 device), and the use of aircraft would have limited availability to the public and other entities under this alternative and under Alternative 4. However, other entities could register sodium cyanide (M-44 device) for use in the State under this alternative. In addition, the NDGFD can issue permits for the operation and use of private aircraft to assist with the management of wildlife damage (see NDCC 20.1-02-05, NDAC 30-02-01-02); therefore, other entities could pursue the use of aircraft.

Under NDCC 20.1-07-04, “*a landowner or tenant or that person's agent may catch or kill any wild fur-bearing animal that is committing depredations upon that person's poultry, domestic animals, or crops...*”. In addition, the NDGFD can also issue permits to people experiencing damage associated with wildlife. People can harvest badgers, coyotes, red fox, and striped skunks throughout the year in the State and can harvest raccoons, bobcats, mountain lions, fishers, mink, and weasels during annual hunting and/or trapping seasons. Management actions taken by non-federal entities would represent the *environmental status quo* (see Section 2.1).

Therefore, those persons experiencing threats or damage associated with predators in the State could lethally remove those species or request assistance from other entities despite WS’ lack of direct involvement in the management action. The WS program in North Dakota would have no direct effect on predator populations from a program implementing technical assistance only. The number of predators lethally removed annually would likely be similar to the other alternatives. Local predator populations could decline, stay the same, or increase depending on actions taken by those persons experiencing predator damage. WS’ participation in a management action would not be additive to an action that would occur in the absence of WS’ participation.

With the oversight of the NDGFD, it is unlikely that damage management activities conducted by other entities would adversely affect native predator populations by implementation of this alternative by WS. Under this alternative, other entities could provide damage management actions and direct operational assistance, such as the NDGFD, the NDDA, and/or private entities. If direct operational assistance was not available from WS or other entities, it is hypothetically possible that frustration caused by the inability to reduce damage and associated losses could lead to illegal removal, which could lead to real but unknown effects on the population of predators and other wildlife. People have resorted to the illegal use of chemicals and methods to alleviate the damage that predators cause (*e.g.*, see Allen et al. 1996, United States Department of Justice 2014, United States Department of Justice 2015).

Alternative 4 - No Predator Damage Management Conducted by WS

Under this alternative, WS would have no direct involvement with any aspect of addressing damage caused by predators and would provide no technical assistance. No removal of predators by WS would occur under this alternative. While WS would provide no assistance under this alternative, other individuals or entities could conduct lethal damage management resulting in lethal removal levels similar to Alternative 1. WS would refer all requests for assistance associated with predators to other entities, such as the NDGFD, the NDDA, and/or private entities.

Despite no involvement by WS in resolving damage and threats associated with predators in the State, those people experiencing damage caused by predators could continue to alleviate damage by employing

both non-lethal and lethal methods. Similar to the other alternatives, those methods described in Appendix B would be available to those persons experiencing damage or threats associated with predators in the State; however, immobilizing drugs, euthanasia chemicals, sodium cyanide (M-44 devices), and the use of aircraft would have limited availability to the public and other entities under this alternative. Like the other alternatives, the use of non-lethal methods by those entities experiencing damage associated with predators or their agents would not occur at such levels that adverse effects would occur to the populations of those species in the State.

Similar to all the alternatives, people could continue to alleviate damage by lethally removing predators similar to Alternative 3. The number of predators that other entities would lethally remove annually under this alternative would be unknown but could be similar to the other alternatives. Therefore, local predator populations could decline, stay the same, or increase depending on actions taken by those persons experiencing predator damage. Management actions taken by non-federal entities would represent the *environmental status quo*.

Some resource/property owners may take illegal, unsafe, or environmentally harmful action against local populations of predators out of frustration or ignorance. In the past, people have resorted to the illegal use of chemicals and methods to alleviate the damage that predators cause (*e.g.*, see Allen et al. 1996, United States Department of Justice 2014, United States Department of Justice 2015).

The number of predators that other entities would lethally remove annually under this alternative would be unknown but could be similar to the other alternatives. Local predator populations could decline, stay the same, or increase depending on actions taken by those persons experiencing predator damage. Since other entities could still remove predators under this alternative, the potential effects on predator populations in the State would be similar to the other alternatives for this issue. WS' involvement would not be additive to removal that could occur since the cooperators requesting WS' assistance could conduct predator damage management activities without WS' direct involvement. Therefore, any actions to resolve damage or reduce threats associated with predators could occur by other entities despite WS' lack of involvement under this alternative.

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

As discussed previously, a concern would be the potential impacts to non-target species, including T&E species, from the use of methods to resolve damage caused by predators. Non-target species could be killed unintentionally during damage management activities whether implemented by WS, other agencies, or the public. Discussion on the potential effects of the alternatives on the populations of non-target animal species, including T&E species, occurs below.

Alternative 1 - Continue the Current Adaptive Integrated Methods Approach to Managing Predator Damage (No Action/Proposed Action)

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

Personnel from WS would have experience with managing animal damage and would receive training in the employment of methods, which would allow WS' employees to use the WS Decision Model to select the most appropriate methods to address damage caused by targeted predators and to exclude 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 were as specific to target species as possible, and determine placement of methods to avoid exposure to non-targets. A discussion of the SOPs to prevent and reduce any potential adverse effects on non-targets occurs in Chapter 3 of this EA. Despite the best efforts to minimize non-target exposure to methods during program activities, the potential for WS to disperse or lethally remove non-targets exists when applying both non-lethal and lethal methods to manage damage or reduce threats to safety.

Non-lethal methods have the potential to cause adverse effects to non-targets primarily through exclusion, harassment, and dispersal. Any exclusionary device erected to prevent access by predators also potentially excludes species that were not the primary reason for erecting the exclusion; therefore, exclusion methods potentially could adversely affect non-target species if the area excluded was large enough. The use of auditory and visual dispersal methods to reduce damage or threats caused by predators would also likely disperse non-targets in the immediate area the methods were employed. Therefore, non-targets may disperse permanently from an area while employing non-lethal dispersal techniques. However, like target species, the potential impacts on non-target species would likely be temporary with target and non-target species often returning after the cessation of dispersal methods.

Non-lethal methods that use auditory and visual stimuli to reduce or prevent damage elicit fright responses in animals. When employing those methods to disperse or harass target species, any non-targets nearby when employing those methods would also likely disperse from the area. Similarly, any exclusionary device constructed to prevent access by predators could also exclude access to some non-target species. The persistent use of non-lethal methods would likely result in the dispersal or abandonment of those areas where non-lethal methods were employed of both predators and non-target species. Therefore, any use of non-lethal methods would likely elicit a similar response from both non-target and target predators. Although non-lethal methods do not result in the lethal removal of non-targets, the use of non-lethal methods could restrict or prevent access of non-targets to beneficial resources. However, long-term adverse effects would not occur to a species' population since WS would not employ non-lethal methods over large geographical areas or at such intensity levels that resources (*e.g.*, food sources, habitat) would be unavailable for extended durations or over a wide geographical scope. Non-lethal methods would generally have minimal impacts on overall populations of animals since individuals of those species were unharmed. Overall, the use of non-lethal methods would not adversely affect populations of animals since those methods would often be temporary.

Other non-lethal methods available for use under this alternative would include live traps and immobilizing drugs. Live traps restrain animals once captured; therefore, those methods are live-capture methods. Live traps would have the potential to capture non-target species. Trap placement in areas where target predators were active and the use of target-specific attractants would likely minimize the capture of non-targets. Attending to traps appropriately would allow the release of any non-targets captured unharmed.

WS could employ immobilizing drugs to handle and transport predators. WS' personnel would apply immobilizing drugs directly to target animals through hand injection or by projectile (*e.g.*, dart gun). WS would make reasonable efforts to retrieve projectiles containing immobilizing drugs if misses occurred or if the projectile detached from target animals. Therefore, no direct effects to non-target animals would be likely since identification would occur prior to application. Animals anesthetized using immobilizing drugs recover once the animal has fully metabolized the drug. Therefore, non-targets that may consume animals that recover are unlikely to receive a dosage that would cause any impairment. When using immobilizing drugs to handle or transport target animals, WS would monitor anesthetized animals until that animal recovers sufficiently to leave the site.

Potential impacts to non-targets from the use of non-lethal methods would be similar to the use of non-lethal methods under any of the alternatives. Non-targets would generally be unharmed from the use of non-lethal methods under any of the alternatives since no lethal removal would occur. Non-lethal methods would be available under all the alternatives analyzed. Using the WS Decision Model, WS' personnel would consider the potential effects to non-targets from the potential use of non-lethal methods. Potential impacts to non-targets under this alternative from the use of and/or the recommendation of non-lethal methods are likely to be low.

WS' personnel could also employ and/or recommend lethal methods under Alternative 1 to alleviate damage, when employees, using the WS Decision Model, deemed those methods appropriate for use. Lethal methods available for use to manage damage caused by predators under this alternative would include the recommendation of harvest during the hunting and/or trapping season, shooting, cable devices, euthanasia chemicals, fumigants (coyotes, red fox, striped skunks only), sodium cyanide (coyotes, fox, feral dogs only), and euthanasia after live-capture. Available methods and the application of those methods to resolve predator damage is further discussed in Appendix B.

The use of firearms would essentially be selective for target predators since WS' personnel would identify animals prior to application; therefore, WS does not anticipate any adverse effects from use of this method. Similarly, the use of euthanasia methods would not result in non-target removal since identification would occur prior to euthanizing an animal.

When using gas cartridges, burrows and dens would be observed for the presence of non-targets before the use of gas cartridges. If non-target activity (*e.g.*, tracks, scat) were observed, the fumigation of those burrows or dens would not occur. Since non-targets are known to occur in burrows or dens, some risks of unintentional removal of non-targets does exist from the use of gas cartridges. WS' personnel would only use gas cartridges in active burrows or dens only, which would minimize risk to non-targets. Risks to non-targets can be minimized by treating only burrows that appear to be active (Dolbeer et al. 1991). There are no secondary poisoning risks involved with the use of gas cartridges as the gas produced dissipates into the atmosphere shortly after activation. Primary risks to non-targets would be minimized by treating only active burrows or dens, by covering entrances of burrows or dens, and by following the pesticide label. Although non-targets could be present in burrows or dens, even after WS' conducts site investigations, the risks would be relatively low and unintentional removal from the use of gas cartridges would be limited.

WS' personnel would place and use cable devices, fumigants (coyotes, red fox, striped skunks only), and sodium cyanide (coyotes, fox, feral dogs only) in such a manner as to minimize the threat to non-target species by placement in those areas frequently used by target animals, using baits or lures that are as species specific as possible, and modification of individual methods to exclude non-targets from being unintentionally removed. Shivik et al. (2014) found M-44 devices using sodium cyanide capsules to be highly selective toward killing canid species. The recommendation of harvest during the hunting/trapping season would not increase risks to non-targets beyond those associated with normal hunting/trapping activities.

An issue that has arisen is the potential for low-level flights to disturb wildlife, including T&E species. Aerial operations could be an important method of damage management in North Dakota when used to address damage or threats in remote areas. Aerial operations involving shooting would only occur in those areas where WS and the property owner/manager signed a work initiation document allowing the use of aircraft. WS could also use aircraft for aerial surveys of wildlife or radio telemetry. The amount of time spent conducting aerial operations would vary depending on the survey area, severity of damage, the size of the area where damage or threats were occurring, and the weather, as low-level aerial activities

would be restricted to visual flight rules and would be impractical in high winds or at times when animals were not easily visible.

Aircraft play an important role in the management of various wildlife species for many agencies. Resource management agencies rely on low flying aircraft to monitor the status of many animal populations, including large mammals (Lancia et al. 2000), birds of prey (Fuller and Mosher 1987), waterfowl (Bellrose 1976), and colonial waterbirds (Speich 1986). Low-level flights also occur when entities use aircraft to track animal movements by radio telemetry (Gilmer et al. 1981, Samuel and Fuller 1996).

A number of studies have looked at responses of various wildlife species to aircraft overflights. The National Park Service (1995) reviewed the effects of aircraft overflights on wildlife and suggested that adverse effects could occur to certain species. Some species will frequently or at least occasionally show an adverse response to even minor overflights. In general though, it appears that the more serious potential adverse effects occur when overflights are chronic (*i.e.*, they occur daily or more often over long periods). Chronic exposures generally involve areas near commercial airports and military flight training facilities. Aerial operations conducted by WS rarely occur in the same areas on a daily basis, and aircraft used by WS actually spend little time flying over those particular areas.

The effects on wildlife from military-type aircraft have been studied extensively (Air National Guard 1997), and were found to have no expected adverse effects on wildlife. Examples of species or species groups that people have studied with regard to the issue of aircraft-generated disturbance are as follows:

WATERBIRDS AND WATERFOWL: Low-level overflights of two to three minutes in duration by a fixed-wing airplane and a helicopter produced no “*drastic*” disturbance of tree-nesting colonial waterbirds, and, in 90% of the observations, the individual birds either showed no reaction or merely looked up (Kushlan 1979). Belanger and Bedard (1989, 1990) observed responses of greater snow geese (*Chen caerulescens atlantica*) to man-induced disturbance on a sanctuary area and estimated the energetic cost of such disturbance. Belanger and Bedard (1989, 1990) observed that disturbance rates exceeding two per hour reduced goose use of the sanctuary by 50% the following day. They also observed that about 40% of the disturbances caused interruptions in feeding that would require an estimated 32% increase in nighttime feeding to compensate for the energy lost. They concluded that managers should strictly regulate overflights of sanctuary areas to avoid adverse effects. Conomy et al. (1998) quantified behavioral responses of wintering American black ducks (*Anas rubripes*), American wigeon (*A. americana*), gadwall (*A. strepera*), and American green-winged teal (*A. crecca carolinensis*) exposed to low-level military aircraft and found that only a small percentage (2%) of the birds reacted to the disturbance. They concluded that such disturbance was not adversely affecting the “*time-activity budgets*” of the species. Low-level aerial operations conducted by WS would not occur over federal, state, or other governmental agency property without the concurrence of the managing entity. If requested, WS would conduct those flights to reduce threats and damages occurring to natural resources, which should not result in impacts to bird species. Thus, there is little to no potential for any adverse effects on waterbirds and waterfowl.

RAPTORS: The Air National Guard analyzed and summarized the effects of overflight studies conducted by numerous federal and state government agencies and private organizations (Air National Guard 1997). Those studies determined that military aircraft noise initially startled raptors, but negative responses were brief and did not have an observed effect on productivity (see Ellis 1981, Fraser et al. 1985, Lamp 1989, United States Forest Service 1992 as cited in Air National Guard 1997). A study conducted on the impacts of overflights to bald eagles (*Haliaeetus leucocephalus*) suggested that the eagles were not sensitive to this type of disturbance (Fraser et al. 1985). During the study, observations were made of more than 850 overflights of active eagle nests. Only two eagles rose out of either their

incubation or brooding postures. This study also showed that perched adults were flushed only 10% of the time during aircraft overflights. Evidence also suggested that golden eagles (*Aquila chrysaetos*) were not highly sensitive to noise or other aircraft disturbances (Ellis 1981, Holthuijzen et al. 1990). Finally, one other study found that eagles were particularly resistant to disturbances flushing them from their nests (see Awbrey and Bowles 1990 as cited in Air National Guard 1997). Therefore, there is considerable evidence that overflights during aerial operations would not adversely affect eagles.

Mexican spotted owls (*Strix occidentalis lucida*) (Delaney et al. 1999) did not flush when chain saws and helicopters were greater than 110 yards away; however, owls flushed to these disturbances at closer distances and were more prone to flush from chain saws than helicopters. Owls returned to their pre-disturbance behavior 10 to 15 minutes following the event and researchers observed no differences in nest or nestling success (Delaney et al. 1999), which indicates that aircraft flights did not result in adverse effects on owl reproduction or survival.

Andersen et al. (1989) conducted low-level helicopter overflights directly at 35 red-tailed hawk (*Buteo jamaicensis*) nests and concluded their observations supported the hypothesis that red-tailed hawks habituate to low level flights during the nesting period since results showed similar nesting success between hawks subjected to overflights and those that were not. White and Thurow (1985) did not evaluate the effects of aircraft overflights, but found that ferruginous hawks (*B. regalis*) were sensitive to certain types of ground-based human disturbance to the point that reproductive success may be adversely affected. However, military jets that flew low over the study area during training exercises did not appear to bother the hawks, nor did the hawks become alarmed when the researchers flew within 100 feet in a small fixed-wing aircraft (White and Thurow 1985). White and Sherrod (1973) suggested that disturbance of raptors by aerial surveys with helicopters may be less than that caused by approaching nests on foot. Ellis (1981) reported that five species of hawks, two falcons (*Falco* spp.), and golden eagles (*Aquila chrysaetos*) were “incredibly tolerant” of overflights by military fighter jets, and observed that, although birds frequently exhibited alarm, negative responses were brief and the overflights never limited productivity.

Grubb et al. (2010) evaluated golden eagle response to civilian and military (Apache AH-64) helicopter flights in northern Utah. Study results indicated that golden eagles exposed to flights ranging from 100 to 800 meters along, towards, and from behind occupied cliff nests did not adversely affect eagle courtship, nesting, and fledglings, indicating that no special management restrictions were required in the study location.

The above studies indicate raptors were relatively unaffected by aircraft overflights, including those by military aircraft that produce much higher noise levels. Therefore, aerial operations would have little or no potential to affect raptors adversely.

PASSERINES: Reproductive losses have been reported in one study of small territorial passerines (“perching” birds that included sparrows, blackbirds) after exposure to low altitude overflights (see Manci et al. 1988 as cited in Air National Guard 1997), but natural mortality rates of both adults and young are high and variable for most species. The research review indicated passerine birds cannot be driven any great distance from a favored food source by a non-specific disturbance, such as military aircraft noise, which indicated quieter noise would have even less effect. Passerines avoid intermittent or unpredictable sources of disturbance more than predictable ones, but return rapidly to feed or roost once the disturbance ceases (Gladwin et al. 1988, United States Forest Service 1992). Those studies and reviews indicated there is little or no potential for aerial operations to cause adverse effects on passerine bird species.

PRONGHORN (ANTELOPE) AND MULE DEER: Krausman et al. (2004) found that Sonoran pronghorn (*Antilocapra americana sonoriensis*) were not adversely affected by military fighter jet

training flights and other military activity on an area of frequent and intensive military flight training operations. Krausman et al. (1986) reported that only three of 70 observed responses of mule deer (*Odocoileus hemionus*) to small fixed-wing aircraft overflights at 150 to 500 feet above ground level resulted in the deer changing habitats. The authors believed that the deer might have been accustomed to overflights because the study area was near an interstate highway that aircraft frequently followed. Krausman et al. (2004) also reported that pronghorn and mule deer do not hear noise from military aircraft as well as people, which potentially indicates why they appeared not to be disturbed as much as previously thought.

MOUNTAIN SHEEP: Krausman and Hervert (1983) reported that, of 32 observations of the response of mountain sheep to low-level flights by small fixed-wing aircraft, 60% resulted in no disturbance, 81% in no or “slight” disturbance, and 19% in “great” disturbance. Krausman and Hervert (1983) concluded that flights less than 150 feet above ground level could cause mountain sheep to leave an area. When Weisenberger et al. (1996) evaluated the effects of simulated low altitude jet aircraft noise on desert mule deer (*Odocoileus hemionus crooki*) and mountain sheep (*Ovis canadensis mexicana*), they found that heart rates of the ungulates increased according to the dB levels, with lower noise levels prompting lesser increases. When they were elevated, heart rates rapidly returned to pre-disturbance levels suggesting that the animals did not perceive the noise as a threat. Responses to the simulated noise levels decreased with increased exposure.

BISON: Fancy (1982) reported that only two of 59 bison (*Bison bison*) groups showed any visible reaction to small fixed-winged aircraft flying at 200 to 500 feet above ground level. The study suggests that bison were relatively tolerant of aircraft overflights.

DOMESTIC ANIMALS AND SMALL MAMMALS: A number of studies with laboratory animals (*e.g.*, rodents [Borg 1979]) and domestic animals (*e.g.*, sheep [Ames and Arehart 1972]) have shown that these animals can habituate to noise. Long-term lab studies of small mammals exposed intermittently to high levels of noise demonstrate no changes in longevity. The physiological “fight or flight” response, while marked, does not appear to have any long-term health consequences on small mammals (Air National Guard 1997). Small mammals habituate, although with difficulty, to sound levels greater than 100 dbA (United States Forest Service 1992).

Although some of those wildlife species discussed above are not present in North Dakota, the information demonstrates the relative tolerance most wildlife species have of overflights, even those that involve noise at high decibels, such as from military aircraft. In general, the greatest potential for impacts to occur exists when overflights are frequent, such as hourly and over many days that could represent “chronic” exposure. Chronic exposure situations generally involve areas near commercial airports and military flight training facilities. Even then, many wildlife species often habituate to overflights, which would naturally minimize any potential adverse effects where such flights occur on a regular basis. Therefore, aircraft used by WS should have far less potential to cause any disturbance to wildlife than military aircraft because the military aircraft produce much louder noise and would be flown over certain training areas many more times per year, and yet were found to have no expected adverse effects on wildlife (Air National Guard 1997).

WS would only conduct aerial activities on a very small percentage of the land area of the State, which indicates that WS would not even expose most wildlife to aerial overflights. Further lessening the potential for any adverse effects would be that such flights occur infrequently throughout the year.

EFFECTS ON NON-TARGET ANIMAL POPULATIONS FROM WS' PREVIOUS ACTIVITIES

While WS' personnel take precautions to safeguard against taking non-targets during operational use of methods and techniques, the use of such methods could result in the unintentional live-capture or lethal removal of unintended species. WS' personnel can minimize non-target captures by selective trap placement, breakaway snare locks (Phillips et al. 1990, Phillips and Blom 1991, Proulx et al. 2015), loop stops on cable devices (Proulx et al. 2015), trap pan-tension devices (Phillips and Gruver 1996), and proper site selection in accordance with WS' policy (see WS Directive 2.101, WS Directive 2.450, WS Directive 2.455). Nevertheless, WS could remove some non-target animals unintentionally during activities conducted to alleviate predator damage.

Table 4.2 shows the number of non-targets lethally removed unintentionally during activities conducted by WS to alleviate damage caused by target predator species from FY 2010 through FY 2014. The previous non-targets lethally removed unintentionally by WS are representative of non-targets that WS' personnel could lethally remove under Alternative 1. Although WS' personnel could lethally remove additional species of non-targets unintentionally, the removal of individuals from any species would not likely increase substantively above the number of non-targets removed annually by WS during previous damage management activities.

Between FY 2010 and FY 2014, the WS program in North Dakota lethally removed 75 non-target animals unintentionally in cable devices, 78 animals unintentionally in foothold traps, and 46 animals unintentionally with sodium cyanide (M-44 devices). WS' use of body-grip traps, euthanasia chemicals, firearms, and gas cartridges did not result in any known lethal removal of non-targets in the State between FY 2010 and FY 2014.

Table 4.2 – WS' lethal removal of non-target animals in North Dakota, FY 2010 – FY 2014

Species	2010	2011	2012	2013	2014	Total
Badger¹	11	5	7	6	5	34
Bobcat¹	2	-	4	1	-	7
Coyote¹	-	-	2	1	-	3
Domestic Dog	-	-	-	1	3	4
Feral Dog¹	1	-	2	9	2	14
Feral Cat¹	-	-	-	1	-	1
Mule Deer	1	-	-	-	-	1
Porcupine	4	-	3	2	2	11
Pronghorn Antelope	1	-	-	1	1	3
Raccoon¹	6	4	17	3	7	37
Red Fox¹	4	2	21	10	8	45
Striped Skunk¹	5	3	6	3	3	20
Swift Fox	1	-	1	-	-	2
White-tailed Deer	-	-	1	-	1	2
White-tailed Jackrabbit	6	-	1	-	-	7
Bald Eagle	-	-	-	1	-	1
Common Raven	-	-	-	5	-	5
Golden Eagle	-	-	-	-	1	1
Wild Turkey	1	-	-	-	-	1

¹Included in overall predator removal documented in Table 4-1

EFFECTS ON NON-TARGET FURBEARER POPULATIONS FROM PREVIOUS ACTIVITIES

The analysis conducted by the NDGFD of WS' activities conducted between FY 2005 and FY 2014 included the cumulative removal (*i.e.*, intentional and unintentional removal) of coyotes, red fox, raccoons, badgers, bobcats, and striped skunks by WS (see Appendix D). As discussed previously, the analysis conducted by the NDGFD of WS' activities conducted between FY 2005 and FY 2014 indicated the cumulative removal of those species, including unintentional removal by WS did not have adverse effects on those species' populations. Since Alternative 1 would be a continuation of the current program of using an adaptive integrated methods approach to managing damage, WS expects the cumulative removal of coyotes, red fox, raccoons, badgers, bobcats, and striped skunks to be similar to WS' previous activities conducted between FY 2005 and FY 2014. WS would continue to provide the NDGFD with annual activity reports to ensure the NDGFD has the opportunity to consider all lethally removal conducted by WS.

The NDGFD also considers the swift fox (*Vulpes velox*) to be a "furbearer" species in the State; however, the NDGFD does not allow people to hunt and/or trap swift fox in the State (*i.e.*, a continuous closed season) (Dalrymple 2014). The historic range of the swift fox extended from eastern New Mexico and western Texas north through portions of Oklahoma, Colorado, Kansas, Nebraska, Wyoming, South Dakota, Montana, North Dakota, and into portions of the Canadian provinces of Alberta, Saskatchewan, and Manitoba (Sovada et al. 2009). Swift fox populations began to decline in the early 1900s from loss of habitat, persecution, and loss of food resources. Those factors lead to the extirpation of the swift fox from much of their historic range. Swift fox once occurred throughout most of North Dakota (Bailey 1926) but similar factors that lead to population declines across their range also lead to the likely extirpation of swift fox from the State during the early 1900s. The dispersion of swift fox from populations re-introduced into parts of Montana and South Dakota has led to the re-establishment of swift fox in extreme southwestern North Dakota (Dyke et al. 2015). Today, swift fox are uncommon in the southwestern part of the State (Tucker 2015) but they are likely a resident species with potential breeding occurring (Dyke et al. 2015).

The NDGFD considers swift fox to be a species of conservation priority in the State (Dyke et al. 2015). The NDGFD places species of conservation priority in one of three priority levels. The NDGFD considers swift fox to be a Level II priority species in the State, which are species with a moderate level of conservation priority or a high level of conservation priority but a substantial level on non-State Wildlife Grant funding is available for them. The NDGFD currently has plans to monitor the swift fox population in the State (Dyke et al. 2015).

WS lethally removed two swift fox unintentionally during activities targeting coyotes between FY 2009 and FY 2014. WS lethally removed one swift fox during FY 2010 and one fox during FY 2012. Coyote predation on swift fox is a major cause of mortality in some parts of its range (Sovada et al. 1998, Schautster et al. 2002, Cypher 2003). Therefore, while WS' actions, under Alternative 1, may result in the unintentional removal of swift fox, those same actions directed towards coyotes to alleviate damage may also benefit local swift fox populations (Allardyce and Sovada 2003). WS anticipates the risks of removing swift fox unintentionally under Alternative 1 to remain similar to previous activities. The limited unintentional removal that could occur by WS under Alternative 1 is not likely to have negative effects on the overall swift fox population in the State. The WS program would continue to provide information on WS' activities to the NDGFD; therefore, the NDGFD would have the opportunity to consider mortality, including the unintentional removal by WS, as part of their monitoring and management efforts of the swift fox population in the State.

EFFECTS OF NON-TARGET REMOVAL ON NON-FURBEARER SPECIES

Between FY 2010 and FY 2014, the WS program in North Dakota has also lethally removed one mule deer (*Odocoileus hemionus*), two white-tailed deer (*Odocoileus virginianus*), three pronghorn (*Antilocapra americana*), seven white-tailed jackrabbits (*Lepus townsendii*), and eleven porcupines (*Erethizon dorsatum*) unintentionally as non-targets (see Table 4.2). The NDGFD considers mule deer, white-tailed deer, and pronghorn as “big game” animals in the State. The NDGFD allows people to harvest those big game species during annual hunting season in the State. The limited unintentional lethal removal of those species by WS would be of low magnitude when compared to the number of those animals that people harvest in the State annually and the statewide populations of those species. Under Alternative 1, WS anticipates the unintentional lethal removal of mule deer, white-tailed deer, and pronghorn to be minimal. The limited lethal removal of those species by WS would not limit the ability of people to harvest those species in the State during annual hunting seasons.

The NDGFD allows people to harvest white-tailed jackrabbits and porcupines throughout the year (*i.e.*, no closed season). In addition, the NDGFD places no limit on the number of jackrabbits and porcupines that people can harvest in the State. Between FY 2010 and FY 2014, the WS program has lethally removed an average of one jackrabbit and six porcupines per year. Under Alternative 1, the WS program expects the risks of removing jackrabbits and porcupines unintentionally to remain similar to those risks that occurred from FY 2010 and FY 2014. The limited removal of jackrabbits and porcupines that could occur by WS would have minimal effect on the statewide populations of those species and would not limit the ability of people to harvest those species. The NDGFD allowing people to harvest jackrabbits and porcupines throughout the year with no limit on the number that people can harvest also provides an indication that limited removal by WS would not adversely affect statewide populations.

EFFECTS OF NON-TARGET REMOVAL OF BIRDS

While WS’ personnel take precautions to safeguard against taking non-target bird species during the operational use of methods and techniques for resolving damage and reducing threats caused by predators, the use of such methods could result in the incidental lethal removal of unintended bird species. The previous non-target bird species lethally removed unintentionally by WS are representative of non-targets that WS could lethally remove under Alternative 1. WS could lethally remove additional species of non-targets unintentionally; however, the removal of individuals from any species would not be likely to increase substantially above the number of non-targets removed annually by WS during previous damage management activities.

Between FY 2010 and FY 2014, the WS program also unintentionally removed one bald eagle, one golden eagle, one wild turkey, and five common ravens. Further evaluation for each of those species occurs below.

Bald Eagle: In 2013, a bald eagle was killed after activating an M-44 device set by WS. The WS program in North Dakota has implemented SOPs for minimizing the accidental removal of eagles (see Section 3.4) in accordance with the reasonable and prudent measures identified in the Biological Opinion issued by the USFWS in 2004. The intent of reasonable and prudent measures, with their implementing terms and conditions, is to minimize incidental take that might otherwise result from the proposed action. At the time the USFWS issued the Biological Opinion in 2004, the USFWS considered bald eagles a threatened species under the authority of the ESA¹⁸. The Biological Opinion issued by the USFWS in

¹⁸The 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.

2004 determined that the proposed activities would not incidentally take more than two bald eagles per year in the State. The USFWS determined the take of two bald eagles per year by WS in North Dakota would not jeopardize the continued existence of the bald eagle.

Although the USFWS has delisted bald eagles in North Dakota pursuant to the ESA (see Section 1.6), the WS program in North Dakota would continue to implement those SOPs discussed in Section 3.4 of this EA, which WS developed in accordance with the reasonable and prudent measures issued by the USFWS. The M-44 device deployed by WS in 2013 that resulted in the unintentional lethal removal of a bald eagle was in a Tier 1 area and WS deployed the device in accordance with the SOPs listed in Section 3.4. The USFWS determined the incidental take of two bald eagles would not jeopardize the continued existence of the bald eagle. Based on this conclusion, the lethal removal of one bald eagle by WS in 2013 did not result in adverse effects to the bald eagle population in the State. In addition, available data for bald eagles continue to show increasing population trends in the State (National Audubon Society 2010, Sauer et al. 2017).

The WS program in North Dakota has submitted a permit application to the USFWS pursuant to 50 CFR 22.26 for limited eagle take that is associated with, but not the purpose of, an activity. WS would comply with all avoidance, minimization, or other mitigation measures specified in the terms of the permit.

Golden Eagle: During FY 2014, a cable device set by WS to capture a coyote inadvertently killed a golden eagle. Golden eagles occur in North Dakota during the winter months as eagles disperse from their breeding areas in the western United States (Kochert 2002). Golden eagle populations in the western United States are stable (Millsap et al. 2013, Nielson et al. 2014), with the number of golden eagles wintering in North Dakota showing a general increasing trend (National Audubon Society 2010). Based on the stable to increasing population trends and the limited number of golden eagles removed by WS unintentionally, the limited removal of one golden eagle did not adversely affect golden eagle populations.

The WS program in North Dakota has submitted a permit application to the USFWS pursuant to 50 CFR 22.26 for limited eagle take that is associated with, but not the purpose of, an activity. WS would comply with all avoidance, minimization, or other mitigation measures specified in the terms of the permit.

Other Birds: During FY 2013, M-44 devices set by WS killed five common ravens unintentionally in the State. The number of common ravens observed in the State during annual bird surveys continues to show general increasing trends (National Audubon Society 2010, Sauer et al. 2017). Based on the limited removal that has occurred by WS and the general increasing population trends, the removal of five common ravens during FY 2013 did not adversely affect statewide populations of ravens.

During FY 2010, a cable device set by WS killed one wild turkey unintentionally in the State. Wild turkeys maintain sufficient densities in the State to allow annual harvest seasons. The NDGFD allows people to harvest turkeys during annual fall and spring season in the State. When compared to the annual harvest of turkeys in the State, the limited removal that has occurred or could occur by WS under Alternative 1 would be of low magnitude, which would not limit the ability of people to harvest turkeys in the State.

ANALYSIS OF RISKS TO THREATENED AND ENDANGERED SPECIES

WS would make special efforts to avoid jeopardizing T&E species through biological evaluations of potential effects and the establishment of special restrictions or minimization measures through consultation with the USFWS. The WS program has established guidelines for activities conducted by

personnel associated with threatened or endangered species (see WS Directive 2.310). Chapter 3 of this EA describes several SOPs to avoid effects to T&E species.

The WS program in North Dakota has previously consulted with the USFWS pursuant to Section 7 of the ESA associated with proposed activities to alleviate damage caused by predators. In addition, the WS program in North Dakota reviews program activities and the current list of threatened or endangered species to identify newly listed species in the State to ensure compliance with the ESA.

The WS program has consulted with the USFWS both at the national and state levels previously. The USFWS issued a biological opinion for the entire nationwide WS program in July 1992. On March 15, 1996, the WS program in North Dakota initiated consultation with the USFWS on effects to threatened or endangered species across North Dakota. At that time, the USFWS determined that activities conducted by WS to manage damage associated with predators would have no effect on species listed as threatened or endangered in the State that were not included in the biological opinion issued in July 1992 for the entire WS program in United States.

On December 9, 2003, WS requested initiation of formal and informal consultation under Section 7 of the ESA concerning the possible effects of WS' activities on the threatened and endangered species found in North Dakota. As part of that consultation process, WS conducted a review of potential impacts of the proposed action on each of the species listed at the time the consultation occurred. The evaluations took into consideration the direct and indirect effects of available methods, including resource management methods, physical exclusion methods, and wildlife management methods. For several species listed within the State, WS determined that the proposed activities "*may affect*" those species but those effects would be solely beneficial, insignificant, or discountable, which would warrant a "*not likely to adversely affect*" determination. WS also determined the proposed activities would have no effect on several species listed as threatened, endangered, or considered a candidate species by the USFWS. In addition, WS and the USFWS determined that using methods to manage damage associated with predators may affect and was likely to adversely affect gray wolves in the State.

Based on the biological assessment submitted by WS in December 2003, several coordination meetings between WS and the USFWS, and supporting literature, the USFWS issued a biological opinion on May 26, 2004 and concurred with WS' determinations. In the biological opinion, the USFWS established reasonable and prudent measure for WS in order to minimize the take of gray wolves (see Appendix C). The USFWS also determined that WS could incidentally remove up to four gray wolves per year in the State during activities to manage damage associated with predators. The USFWS further determined that the incidental lethal removal of up to four wolves per year in the State by WS would not jeopardize the gray wolf as long as WS initiated the reasonable and prudent measures (see Appendix C).

The legal classification of gray wolves present in North Dakota has undergone a number of changes. Those changes include:

- February 2007: The USFWS removed gray wolves in the eastern two-thirds of North Dakota from the protection of the ESA. Wolves found east of Highway 83 and the Missouri River were placed under the regulatory authority of the NDGFD and classified as a furbearer with a closed season. Gray wolves in the western portion of North Dakota remained classified as federally endangered and protected by the ESA under the management authority of the USFWS.
- September 2008: A court decision lead the USFWS to relist all wolves in North Dakota as endangered under the protection of the ESA.

- April 2009: The USFWS removed gray wolves in the eastern two-thirds of North Dakota from the protection of the ESA, which transferred regulatory authority to the NDGFD; wolves in the western portion of North Dakota remained classified as federally endangered and protected by the ESA.
- June 2009: Because of a court settlement agreement between the USFWS and several plaintiffs, gray wolves throughout all of North Dakota were again relisted as federally endangered under the protection of the ESA.
- December 2011: The USFWS removed gray wolves in the eastern two-thirds of North Dakota from the protection of the ESA and they came under the regulatory authority of the NDGFD; wolves in the western portion of North Dakota remained classified as federally endangered and protected by the ESA.
- December 19, 2014: The District Court for the District of Columbia vacated the Final Rule issued in December 2011 that had removed gray wolves in the eastern two-thirds of North Dakota from the protection of the ESA. Because of the ruling, gray wolves throughout all of North Dakota are again listed as federally endangered under the protection of the ESA and the management authority of the USFWS.

Since FY 2005, the WS program in North Dakota has unintentionally removed three gray wolves during activities targeting coyotes. In FY 2005, WS unintentionally removed one gray wolf in a neck snare. In FY 2006, WS unintentionally killed one gray wolf when the wolf activated an M-44 device. In both incidences, WS was operating pursuant to the reasonable and prudent measures established by the USFWS in the biological opinion issued in 2004. In FY 2009, WS killed one gray wolf unintentionally in Foster County during May, which occurred in a location and during a time when the USFWS had removed wolves from protection of the ESA and wolves were under the regulatory authority of the NDGFD. During that period, the NDGFD considered gray wolves to be a furbearer with a closed harvest season (Hoeven 2008).

With gray wolves currently classified as federally endangered throughout North Dakota, WS continues to follow the reasonable and prudent measures established by the USFWS in the biological opinion issued during 2004. The use patterns of methods available to manage damage associated with predators continue to be the same. Therefore, WS' actions under Alternative 1 are not likely to result in an incidental take of more than four gray wolves in any given year, which would not negatively affect the overall wolf population.

Since WS initiated consultation with the USFWS in 2003, the USFWS has listed additional species as threatened or endangered in the State. Since WS consulted with the USFWS in 2003, the USFWS has listed the Dakota skipper (*Hesperia dacotae*), Poweshiek skipperling (*Oarisma poweshiek*), northern long-eared bat (*Myotis septentrionalis*), and red knot (*Calidris canutus rufa*) in the State. Table 4.3 contains the federal list of species currently threatened or endangered in the State along with their common and scientific names. In addition, the USFWS has designated critical habitat for the Dakota skipper, Poweshiek skipperling, and piping plover in North Dakota. Table 4.3 also includes WS' effects determination for each of the threatened or endangered species within the State.

During the development of this EA, WS reviewed the current list of species designated as threatened or endangered in North Dakota as determined by the USFWS. WS conducted a review of potential impacts of activities on each of those species listed in Table 4.3. The evaluation took into consideration the direct and indirect effects of available methods and WS' activities to manage predator damage. WS reviewed

the status, critical habitats designations, and current known locations of those species identified in Table 4.3. In addition, WS reviewed the methods available to manage predator damage, the use patterns of those methods, and the areas where previous requests for assistance associated with predators have occurred within the State. In August 2016, WS submitted a biological assessment to re-initiate consultation with the USFWS pursuant to Section 7 of the ESA.

Table 4.3 – Federal list of threatened or endangered species in North Dakota

Common Name	Scientific Name	Status [†]	Determination [‡]
Animals			
Invertebrates			
Dakota Skipper	<i>Hesperia dacotae</i>	T	MANLAA
Dakota Skipper Critical Habitat		H	NE
Poweshiek Skipperling	<i>Oarisma poweshiek</i>	E	MANLAA
Poweshiek Skipperling Critical Habitat		H	NE
Fish			
Pallid Sturgeon	<i>Scaphirhynchus albus</i>	E	NE
Mammals			
Gray Wolf	<i>Canis lupis</i>	E	MALAA
Northern Long-eared Bat	<i>Myotis septentrionalis</i>	T	MANLAA
Birds			
Piping Plover	<i>Charadrius melodus</i>	T	MANLAA
Piping Plover Critical Habitat		H	NE
Interior Least Tern	<i>Sterna antillarum</i>	E	MANLAA
Whooping Crane	<i>Grus americana</i>	E	MANLAA
Red Knot	<i>Calidris canutus rufa</i>	T	MANLAA
Plants			
Western Prairie Fringed Orchid	<i>Platanthera praeclara</i>	T	MANLAA

[†]T=Threatened; E=Endangered; H=Habitat

[‡]NE=No effect; MANLAA=May affect, not likely to adversely affect; MALAA=May affect, likely to adversely affect

The USFWS concurred with WS’ effects determinations in a letter of concurrence dated November 18, 2016 and affirmed its earlier findings that WS could incidentally take up to four gray wolves per year and that level of take would not jeopardize the existence of gray wolves. WS’ personnel would continue to abide by all reasonable and prudent measures, including the terms and conditions that implement the reasonable and prudent measures, as outlined in the biological opinion issued by the USFWS to avoid jeopardizing the status of the gray wolf (see Appendix C).

POTENTIAL FOR ACTIVITIES TO IMPACT BIODIVERSITY AND ECOSYSTEM RESILIENCE

Biodiversity refers to the variety of species within an ecosystem. Ecosystem resilience refers to the magnitude of disturbance that can be absorbed before the system redefines its structure by changing the variables and processes that control behavior (Westman 1978, Gunderson 2000). It also refers to the ability of species and ecosystems to withstand unpredictable fluctuations in environmental conditions (e.g., drought) without jeopardizing species survival or changes in ecosystem structure (Gunderson 2000, Miller et al. 2001, Estes et al. 2011). Predators, particularly apex predators, can have a pronounced impact on biodiversity and ecosystem resilience (Estes et al. 2011). In a diverse ecosystem, there is often redundancy in the roles that species have within the different ecological levels (e.g., apex predators, mesopredators, herbivores, plants, decomposers). In general, ecosystems that are less complex in terms of biodiversity and trophic levels can be more susceptible to adverse impacts and stressors, such as climate change, disease outbreaks, and the introduction of invasive species (Crooks and Soule 1999,

Ritchie and Johnson 2009, Estes et al. 2011, Beschta et al. 2013, Bergstrom et al. 2014).

Predators can influence ecosystems directly through predation and exclusion/reduction in populations of other predators/mesopredators. In addition, predators can influence ecosystems indirectly by altering prey behavior and habitat use, by limiting the abundance of prey species, and by altering the affect those species have on other levels of the food web (Prugh et al. 2009, Ritchie and Johnson 2009, Wallach et al. 2010, Estes et al. 2011, Miller et al. 2012).

The loss of apex predators from an ecosystem can reduce biodiversity and shorten food web lengths. The loss of apex predators can alter the presence and abundance of mesopredators, can increase the intensity of herbivory, and ultimately can impact the abundance and composition of plant communities, soil structure, nutrients, and even the physical characteristics of the environment (Diamond 1992, Berger et al. 2001, Ripple and Beschta 2006a, Ripple and Beschta 2006b, Berger et al. 2008, Beschta and Ripple 2008, Prugh et al. 2009, Estes et al. 2011, Wallach et al. 2015). The presence of native predators in a healthy ecosystem may also improve the ability of the system to resist adverse impacts from invasive species. For example, Wallach et al. (2010) found that increases in dingo populations that occurred in the absence of exclusion fencing and baiting with poison resulted in decreases in mesopredators and generalist herbivores and an increase in small and intermediate-weight mammals.

Most evaluations of the impacts of predator removal or loss on biodiversity involve complete removal of predators over the course of years (*e.g.*, see Berger et al. 2001, Beschta and Ripple 2006, Beschta and Ripple 2008, Frank 2008, Gill et al. 2009, Beschta and Ripple 2012a). Henke (1992, 1995) documented a decline in species richness and rodent diversity and increases in relative abundance of badgers, bobcats, and gray fox (*Urocyon cinereoargenteus*) in areas of Texas where coyote removal occurred continually throughout the year, which resulted in a sustained 48% reduction in the local coyote population. Cottontail rabbit (*Sylvilagus floridanus*) density and raptor richness, species diversity, and density did not differ between control and treatment areas. However, the continual removal of coyotes throughout the year that occurred by Henke (1992) would not normally occur if the WS program in North Dakota implemented this alternative. Similarly, the degree of predator removal (exclusion or intensive population reduction efforts via the use of toxicants sustained throughout the year) was far greater in the study by Wallach et al. (2010) than would occur if the WS program implemented this alternative. Based on the findings by Gese (2005), both the number of coyotes and the number of coyote packs in areas with similar activities to those that WS could conduct if the program implemented this alternative had returned to pre-removal levels within 8 months. Although there was evidence of a reduction in the average age of the local coyote population, there was no evidence that this resulted in an increase in coyote densities above pre-removal levels.

WS' actions do not result in long-term extirpation, eradication, or suppression of any native wildlife species, so the findings of most of those studies are not relevant to activities that WS could conduct. The WS program in North Dakota operates in accordance with federal and State laws and regulations enacted to ensure species viability. If WS implemented this alternative, WS would operate on a relatively small percentage of the land area in North Dakota and the number of animals from a species that WS could lethally remove would be a small proportion of the total population of any species.

WS does not attempt to eradicate or suppress any species of native wildlife. WS operates in accordance with federal and state laws and regulations enacted to ensure species viability. WS would only use available methods to target individual animals or groups of animals identified as causing damage or posing a threat of damage. Any reduction of a local population or group of animals is frequently temporary because immigration from adjacent areas or reproduction replaces the animals removed. WS would only provide assistance under the appropriate alternatives after receiving a request to manage damage or threats of damage. In addition, WS would only provide assistance on a small percentage of the

total land area of North Dakota. Further, WS would only target those predators identified as causing damage or posing a threat. WS would not attempt to suppress predator populations across broad geographical areas at such intensity levels for prolonged durations that significant ecological effects would occur. The goal of WS would not be to reduce predator populations but to manage damage or threats associated with specific individuals of a species.

Ecosystems are communities of living organisms on, and interacting with, a particular landscape. Ecosystems are dynamic entities that are frequently recovering from periodic disturbances. The frequency and severity of each disturbance determines the way it affects ecosystem function and the ecological services they provide. Animal populations vary from year to year, approaching ecological carrying capacity during resource-rich periods and declining from a lack of resources, overstocking, disease outbreaks, or other mortality sources.

Ecosystem services are the suite of benefits that ecosystems provide to humanity (Cardinale et al. 2012). These services include supporting services, which are processes necessary for the production of all other ecosystem services (*e.g.*, nutrient cycling, photosynthesis, and soil formation)(de Groot et al. 2002); provisioning services that involve the production of renewable resources (*e.g.*, food, wood, fresh water) (Cardinale et al. 2012); regulating services, which are those that lessen environmental change (*e.g.*, climate regulation, pest/disease control) (Cardinale et al. 2012); and cultural services representing human values and enjoyment (*e.g.*, landscape aesthetics, cultural heritage, outdoor recreation, and spiritual significance)(Daniel et al. 2012). Biodiversity effects to ecosystem services often receive considerable attention. Consequently, consideration of these ecosystem outputs in management decisions is warranted, and WS is committed to the maintenance of the services provided by the landscapes on which the program works. Given the small number of native predators that WS could remove annually from a given landscape, no loss in ecosystem services is attributable to the program. Since the number of predators that WS could remove annually is a relatively small percentage of overall predator populations, effects to ecosystem resilience are not likely to occur.

As discussed previously, the NDGFD is responsible for managing wildlife populations in the State. Based on their analysis of WS' activities associated with coyotes, red fox, and raccoons (see Appendix D), the NDGFD concluded the proportion of the range for each of the three species affected by WS' activities is negligible. In addition, the NDGFD concluded the annual removal of coyotes by WS did not impacted coyote population trends and the numbers of red fox and raccoon removed annually by WS had no impact on the populations of either of those species. For other target predator species that WS could address, the NDGFD analysis determined “[t]he amount of removal conducted by WS...is minuscule and of no concern to their population sustainability or management”. Based on this information, the WS program in North Dakota concludes that potential impacts associated with the implementation of Alternative 1 would not be of sufficient magnitude or scope at the local or state level to adversely affect biodiversity or ecosystem resilience.

POTENTIAL TO CAUSE TROPHIC CASCADES, INCLUDING MESOPREDATOR RELEASE

A trophic cascade is an indirect ecological effect that occurs when the modification of one trophic level occurs to such an extent that it affects other trophic levels in a food chain or web. In a simple example, predators, their herbivore prey, and plants that provide food for the herbivores are three trophic levels that interact in a food chain. A concern that people identify is the potential effects of removing predators on the populations of prey species. For example, people may be concerned that removing coyotes would cause an increase in rodent and rabbit populations, which could result in detrimental effects on vegetation and other resources.

Trophic cascades can also refer to the impact the presence or absence of a larger apex predator has on

other predator species that may have different impacts on prey populations (Prugh et al. 2009, Brashares et al. 2010, Miller et al. 2012). Apex predators are large carnivores, such as wolves, bears, large cats. Many apex predator species have experienced dramatic range contractions. Their extirpation from an area is believed to have trophic impacts on the ecosystems in which they occurred, especially through the phenomenon of mesopredator release (Prugh et al. 2009, Miller et al. 2012). Mesopredator release refers to trophic impacts from the absence of apex predators on non-apex predators and ecosystems, which may in turn have different impacts on prey populations than the removed apex predators would have (Prugh et al. 2009, Miller et al. 2012). Normally, competition and intraguild predation (Polis et al. 1989) are thought to control mesopredators in the presence of apex predators and limit their effects on ecosystems.

For example, the presence of coyotes has been shown to limit the density of smaller predators, which may prey more heavily on songbirds, ground nesting birds, and some rodents (Levi and Wilmers 2012, Miller et al. 2012). In addition, carnivores, such as badgers, bobcats, and foxes, have been reported to increase numerically when coyote populations are reduced (Robinson 1961, Nunley 1977, Crooks and Soule 1999). Recovery of wolves and associated long-term declines in coyotes have also been documented, with the consequence of increased survivorship among pronghorn fawns (Berger and Conner 2008).

The presence of predatory species can cause reductions in the size of a prey population or cause the prey population to alter its use of habitat, which, in turn, can influence plant community composition and health. Depending on the nature of the impact and the prey species, changes in vegetation and prey behavior can have impacts on abiotic factors, such as soil compaction, soil nutrients, and river morphology (Naiman and Rogers 1997, Beschta and Ripple 2006, Beschta and Ripple 2008, Beschta and Ripple 2012b). Relationships in trophic cascades are not necessarily a simple linear progression, from predators to prey to vegetation, and can branch through the system. For example, reintroduction of wolves in the Yellowstone ecosystem has been associated with changes in elk density and behavior and reductions in browsing on palatable woody plants, such as aspen (*Populus tremuloides*). Understory shrub species richness and height, including berry-producing plants, were positively correlated with increased height of understory aspen. Increases in berry producing plants have the potential to benefit a wide range of animal species, food availability for omnivores and herbivores, and eventually food availability for other species of predators (Beschta and Ripple 2012a). In western Colorado, changes in coyote activity influenced white-tailed deer activity with associated impacts to plant communities (Waser et al. 2014). However, as with most ecosystems, the nature and magnitude of these types of relationships varies. For example, Maron and Pearson (2011) did not detect evidence that the presence of vertebrate predators fundamentally affected primary production or seed survival in a grassland ecosystem.

In general, predators may prolong the low points in rodent population cycles and spread the duration of the population peaks. Predators generally do not control rodent populations (Clark 1972, Wagner and Stoddart 1972, Keith 1974). It is more likely that prey abundance regulates to some degree the populations of predators (Clark 1972, Wagner and Stoddart 1972).

Data on the impacts of coyotes and coyote removal on prey populations are mixed. Wagner (1988) reviewed literature on predator impacts on prey populations and concluded that such impacts vary with the locale. In two studies conducted in south Texas (Beasom 1974, Guthery and Beasom 1977), intensive short-term predator removal was employed to test the response of game species to reduced coyote abundance. At the same time, Beasom (1974) and Guthery and Beasom (1977) monitored rodent and lagomorph species. A marked reduction in coyote numbers apparently had no notable effect on the populations of rabbits or rodents in either study. Similarly, Neff et al. (1985) noted that reducing coyote populations on their study area in Arizona to protect pronghorn antelope fawns had no apparent effect on the rodent or rabbit population. Wagner and Stoddart (1972) noted that coyote predation was a major source of mortality in a black-tailed jackrabbit (*Lepus californicus*) population that may have played an important part in population trends, but they made no connection between predator damage management,

jackrabbit mortality, or coyote population size. In fact, any moderating effects from coyotes on jackrabbit densities in the Wagner and Stoddart (1972) study occurred despite activities that were considerably more intensive (aerial shooting, trapping for bounties and pelts, and the use of poison bait stations) than what normally occurs as part of current activities conducted by WS).

In some ecosystems, prey species, such as snowshoe hares, increased to the point that they depleted vegetative food sources despite predation. In others, coyotes may limit jackrabbit density, while food shortages do not limit jackrabbit abundance (Wagner 1988, Stoddart et al. 2001). Wagner and Stoddart (1972) reported that coyote predation was a major source of jackrabbit mortality in the Curlew Valley of Utah, which may have caused a decline in the local jackrabbit population in the Valley. Wagner and Stoddart (1972) made no connections between coyote removal and jackrabbit mortality or coyote populations. The coyote population in the study conducted by Wagner and Stoddart (1972) was subject to more sustained and intensive removal (aerial shooting, trapping for bounties, pelt harvest, and the use of poisoned baits that were placed in the fall and recovered in the spring) than would occur if the WS program in North Dakota implemented this alternative. Any moderating effects of coyotes on jackrabbit populations occurred even though the population was subject to intensive removals. Wagner and Stoddart (1972) and Clark (1972) independently studied the relationship between coyote populations and jackrabbit populations in northern Utah and southern Idaho. Both Wagner and Stoddart (1972) and Clark (1972) concluded that coyote populations seemed to respond to an abundance of jackrabbits. Complexity of the system and the range of available prey species may also influence the relationships between predators and prey. When a broad range of prey species are available, coyotes will generally feed on all species available; therefore, coyote populations may not vary with changes in the availability of a single prey species (Knowlton 1964, Clark 1972).

Intensive studies of the snowshoe rabbit population cycles by Krebs et al. (2001) reflect the complexity of predator and prey relationships. Krebs et al. (2001) determined a 10-year cycle in snowshoe hares was the result of an interaction between predation and food supplies, with predation playing the principle role in driving the cycle in the hare population. Krebs et al. (2001) found a link between mammalian predator abundance (primarily coyotes and Canada lynx (*Lynx canadensis*)) and the abundance of hares with predator abundance lagging the hare cycle by one to two years. Although Canada lynx and coyotes were key predators influencing hare survival, many species of predators were involved in the cycle, and Krebs et al. (2001) were unable to pinpoint the specific role of any one species of predators. The importance that a range of predators can have on the 10-year cycle of hares occurs on Anticosti Island on the St. Lawrence River in eastern Canada. Canada lynx no longer occur on the island, but the hare cycle persists, likely due to compensatory predation by other species (Keith 1963, Stenseth et al. 1997). Impacts of food in the studies reported by Krebs et al. (2001) appeared to be indirect and were associated with declines in body condition, which may influence chronic stress, the ability of hares to avoid predators, and reproductive output. The study also implicated long-range movement of predators as the potential mechanism behind the synchronicity of the snowshoe hare population cycles over large geographic regions. As indicated previously, the role of predators and food supplies appears to vary. Stevens (2010) provided an example of a system in Sweden in which red fox prey on voles, grouse, and hares. Like the snowshoe hare and lynx example, the fox and prey species appear to have linked population cycles with changes in predator populations following changes in prey populations. However, unlike the snowshoe hare example, forage availability appeared to have a more direct impact on prey populations. Based on forage switching from preferred to less preferred forage, in this system, the availability of forage also acts as a limiting factor on prey populations. When preferred food was scarce, individuals grew more slowly and reproduced less.

Keith (1974) concluded that: 1) during cyclic declines in prey populations, predation has a depressive effect and as a result, the prey populations may decline further and be held for some time at relatively low densities, 2) prey populations may escape this low point when predator populations decrease in response

to low prey populations, and 3) since rabbit and rodent populations increase at a faster rate than predator populations, factors other than predation must initiate the decline in populations. Wagner and Stoddart (1972) and Clark (1972) independently studied the relationship between coyote and black-tailed jackrabbit populations in northern Utah and southern Idaho. Both Wagner and Stoddart (1972) and Clark (1972) concluded that coyote populations seemed to respond to an abundance of jackrabbits. When a broad range of prey species are available, coyotes will generally feed on all species available; therefore, coyote populations may not vary with changes in the availability of a single prey species (Knowlton 1964, Clark 1972).

Rabbit and rodent populations normally fluctuate substantially in several-year cycles. Two hypotheses attempt to explain these cyclic fluctuations. Those two hypotheses maintain that (1) rodent and rabbit populations self-regulate through behavior, changes in reproductive capacity due to stress, or genetic changes (Chitty 1967, Myers and Krebs 1971), or (2) environmental factors regulate populations, such as food and predation (Pitelka 1957, Fuller 1969). Wagner (1988) reviewed literature on predator impacts on prey populations and concluded that such impacts vary with the locale. In some ecosystems, prey species, such as snowshoe hares, increased to the point that they depleted vegetative food sources, despite predation. In others, coyotes may limit jackrabbit density and evidence indicated food shortages do not occur to limit jackrabbit abundance (Wagner 1988). Wagner and Stoddart (1972) reported that coyote predation was a major source of jackrabbit mortality in the Curlew Valley of Utah, which may have caused a decline in the local jackrabbit population in the Valley.

Henke (1995) reviewed literature concerning coyote-prey interactions and concluded that short-term coyote removal efforts (less than six months per year) typically did not result in population increases of small mammal species. Gese (2005) noted no impact to lagomorph abundance from the removal of coyotes, possibly because the controlled coyote population returned to pre-removal levels within eight months, while Henke (1995) noted that control for nine months or longer could impact rodent, rabbit, and forage abundance. Additionally, Miller et al. (2012) noted a sustained reduction in coyote abundance (and presumably abundances of other mesopredators that might be released by the reduction in coyotes) as a consequence of wolf restoration which possibly was associated with increased abundance of voles within three kilometers of wolf dens.

Some individuals have expressed concerns that activities, such as those activities that WS could conduct when implementing this alternative, would cause disruptions to trophic cascades or irruptions in prey populations by eliminating or substantially reducing top predators (*e.g.*, see Prugh et al. 2009, Ritchie and Johnson 2009, Estes et al. 2011, Bergstrom et al. 2014). The WS program in North Dakota has reviewed those studies but, for the most part, they are not applicable to the types of activities that WS could conduct if the program implemented this alternative. Those studies involve reviews of the complete absence of apex consumers from the system (*e.g.*, see Berger et al. 2001, Beschta and Ripple 2006, Beschta and Ripple 2008, Frank 2008, Gill et al. 2009, Ripple et al. 2010, Estes et al. 2011, Ripple et al. 2013). In some instances, impacts have also been observed in cases where the predators were substantially reduced over an extended period (*e.g.*, see Henke 1992, Henke 1995, Henke and Bryant 1999, Wallach et al. 2010). Ripple and Beschta (2006a) documented a site in Zion National Park largely avoided by cougar because of high human activity, an impact sustained over a period of decades. A reduction in cougars resulted in increases in mule deer and associated increases in herbivory on riparian cottonwoods. Ultimately, this resulted in decreased cottonwood regeneration in the riparian area, increases in bank erosion and reduction in both terrestrial and aquatic species abundance.

If the WS program in North Dakota implemented this alternative, WS' activities would not result in an elimination of predators. Lethal removal, when necessary, is highly specific to individual damage situations. For example, WS removes only a minor portion of a coyote population during specific times when livestock are most vulnerable to predation, or WS removes individual animals in response to

damage that is occurring to property or other resources. Studies show that coyotes are highly prolific and capable of rapid repopulation from areas following localized damage management and from sport (hunter) harvest (Gese 1998, Blejwas et al. 2002, Williams et al. 2003). Gese (1998) noted that adjacent coyote packs adjusted territorial boundaries following social disruption in a neighboring pack, thus allowing for complete occupancy of the area despite removal of breeding coyotes. Blejwas et al. (2002) noted that a replacement pair of coyotes occupied a territory in approximately 43 days following the removal of the territorial pair. Williams et al. (2003) noted that temporal genetic variation in coyote populations experiencing high turnover (due to removals) indicated that “...*localized removal effort does not negatively impact effective population size*...”. While removing coyotes from small areas at the appropriate time can protect vulnerable resources (such as birthing and young livestock), immigration of coyotes from the surrounding area quickly replaces the animals removed and maintains biodiversity (Stoddart 1984). Therefore, there is no evidence that coyote damage management actions would lead to indirect increases in mesopredators (*e.g.*, skunk, raccoon, fox).

Therefore, implementation of this alternative would not result in the extirpation or suppression of any native predator population. The number of animals from a species’ population that WS could lethally remove annually under this alternative would be of low magnitude and activities would occur in relatively small or isolated geographical areas. As discussed previously, the NDGFD is responsible for managing wildlife populations in the State. Based on their analysis of WS’ activities associated with coyotes, red fox, and raccoons (see Appendix D), the NDGFD concluded the proportion of the range for each of the three species affected by WS’ activities is negligible. In addition, the NDGFD concluded the annual removal of coyotes by WS did not impacted coyote population trends and the numbers of red fox and raccoon removed annually by WS had no impact on the populations of either of those species. For other target predator species that WS could address, the NDGFD analysis determined “[t]he amount of removal conducted by WS...is minuscule and of no concern to their population sustainability or management”. Based on this information, the WS program in North Dakota concludes that potential impacts associated with the implementation of Alternative 1 would not be of sufficient magnitude or scope at the local or state level to cause trophic cascades or result in mesopredator release.

Alternative 2 – WS Would Address Predator Damage through an Adaptive Integrated Approach Using Only Non-lethal Methods

A non-lethal management alternative would require the WS program to only recommend and use non-lethal methods to manage and prevent damage associated with predators. WS would provide technical assistance and direct operational assistance under this alternative recommending and using only non-lethal methods. Non-lethal methods have the potential to cause adverse effects to non-targets primarily through exclusion, harassment, and dispersal. Any exclusionary device erected to prevent access of target species also potentially excludes species that are not the primary reason the exclusion was erected; therefore, individual non-target species excluded from areas may potentially be adversely affected if the area excluded was large enough. The use of auditory and visual dispersal methods would also likely disperse non-targets in the immediate area the methods were employed. Therefore, when employing non-lethal dispersal techniques, non-targets may disperse permanently from an area. However, like target species, the potential impacts on non-target species would be temporary with target and non-target species often returning after the cessation of dispersal methods.

Live traps (*e.g.*, cage traps, foothold traps) restrain wildlife once captured and are considered live-capture methods. Live traps have the potential to capture non-target species. Trap placement in areas where target species were active and the use of target-specific attractants could minimize the capture of non-targets. If traps were attended to appropriately, any non-targets captured could be released on site unharmed.

WS' involvement in the use of or recommendation of non-lethal methods would ensure non-target impacts were considered under WS' Decision Model. Most non-lethal methods would be available under all the alternatives analyzed. Impacts to non-targets from the use of non-lethal methods would be similar to the use of those non-lethal methods under any of the alternatives. Non-targets would generally be unharmed from the use of non-lethal methods under any of the alternatives since no lethal removal would occur from their use. Similar to the other alternatives, other entities could and would likely continue to use lethal methods and those activities could increase in proportion to the reduction of assistance using lethal methods provided by the WS program. Risks to non-targets and T&E species would continue to occur from activities conducted by other entities, including from those people who implement damage management activities on their own similar to Alternative 3 and Alternative 4.

Alternative 3 – Predator Damage Management by WS through Technical Assistance Only

Under a technical assistance only alternative, WS would have no direct impact on non-target species, including T&E species. Those persons requesting assistance could employ methods that WS' personnel recommend or provide through loaning of equipment. Using the WS Decision Model, WS' personnel would base recommendations from information provided by the person requesting assistance or through site visits. Recommendations would include methods or techniques to minimize non-target impacts associated with the methods that personnel recommend or loan. Methods recommended could include non-lethal and lethal methods as deemed appropriate by the WS Decision Model and as permitted by laws and regulations.

The potential impacts to non-targets under this alternative would be variable and based on several factors. If people employed methods as recommended by WS, the potential impacts to non-targets would likely be similar to Alternative 1. If recommended methods and techniques were not followed or if other methods were employed that were not recommended, the potential impacts on non-target species, including T&E species would likely be higher compared to Alternative 1.

The potential impacts of harassment and exclusion methods on non-target species would be similar to those described under Alternative 1 and Alternative 2. Harassment and exclusion methods would be easily obtainable and simple to employ. Since identification of targets would occur when employing shooting as a method, the potential impacts to non-target species would likely be low under this alternative. However, the knowledge and experience of the person could influence their ability to identify predators correctly.

Those persons experiencing damage from predators may implement methods and techniques based on the recommendations of WS. The knowledge and skill of those persons implementing recommended methods would determine the potential for impacts to occur. If those persons experiencing damage do not implement methods or techniques correctly, the potential impacts from providing only technical assistance could be greater than Alternative 1. The incorrect implementation of methods or techniques recommended by WS could lead to an increase in non-target removal when compared to the non-target removal that could occur by WS under Alternative 1.

If requesters were provided technical assistance but do not implement any of the recommended actions and conducted no further action, the potential to remove non-targets would be lower when compared to Alternative 1. If those persons requesting assistance implement recommended methods appropriately and as instructed or demonstrated, the potential impacts to non-targets would be similar to Alternative 1. If WS made recommendations on the use of methods to alleviate damage but those methods were not implemented as recommended by WS or if those methods recommended by WS were used inappropriately, the potential for lethal removal of non-targets would likely increase under a technical

assistance only alternative. Therefore, the potential impacts to non-targets, including T&E species, would be variable under a technical assistance only alternative.

Under this alternative, if those people requesting assistance from WS deemed recommended non-lethal methods ineffective, those people experiencing damage could employ lethal methods. The potential impacts on non-targets by those persons experiencing damage would be highly variable. People whose predator damage problems were not effectively resolved by non-lethal control methods would likely resort to other means of legal or illegal lethal control. This could result in less experienced people implementing control methods and could lead to greater removal of non-target wildlife than Alternative 1. When those persons experiencing damage caused by wildlife reach a level where assistance does not adequately reduce damage or where no assistance is available, people have resorted to using chemical toxicants that are illegal for use on the intended target species. The illegal use of methods often results in loss of both target and non-target wildlife (*e.g.*, see Allen et al. 1996, United States Department of Justice 2014, United States Department of Justice 2015). The use of illegal toxicants by those persons frustrated with the lack of assistance or assistance that inadequately reduces damage to an acceptable level can often result in the indiscriminate removal of wildlife species.

The ability to reduce negative effects caused by predators to wildlife species and their habitats, including T&E species, would be variable under this alternative. The skills and abilities of the person implementing damage management actions would determine the risks to non-target animals. This alternative would likely have a greater chance of reducing damage than Alternative 4 since WS would be available to provide information and advice on appropriately employing methods and reducing the risk of non-target removal.

Alternative 4 - No Predator Damage Management Conducted by WS

Under this alternative, WS would not provide any assistance with managing damage associated with predators in the State. Therefore, no direct impacts to non-targets or T&E species would occur by WS under this alternative. Risks to non-targets and T&E species would continue to occur from those people who implement damage management activities on their own or through recommendations by other federal, state, and private entities. Although some risks could occur from those people that implement predator damage management in the absence of any involvement by WS, those risks would likely be low, and would be similar to those risks under the other alternatives.

The ability to reduce negative effects caused by predators 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.

Issue 3 - Effects of Damage Management Methods on Human Safety

A common concern is the potential adverse effects that methods available could have on human health and safety. Each of the alternatives below evaluates the threats to human safety of methods available under those alternatives.

Alternative 1 - Continue the Current Adaptive Integrated Methods Approach to Managing Predator Damage (No Action/Proposed Action)

The cooperator requesting assistance would be made aware through a MOU, work initiation document, or a similar document that those methods agreed upon could potentially be used on property owned or managed by the cooperator. Therefore, the cooperator would be made aware of the possible use of those methods on property they own or manage to identify any risks to human safety associated with the use of

those methods. Cooperators would be made aware by signing a MOU, work initiation document, or another similar document, which would assist WS and the cooperating entity with identifying any risks to human safety associated with methods at a particular location.

Under Alternative 1, WS could use or recommend those methods discussed in Appendix B singularly or in combination to resolve and prevent damage associated with predators in North Dakota. WS would use the Decision Model to determine the appropriate method or methods that would effectively resolve the request for assistance. Those methods would be continually evaluated for effectiveness and if necessary, additional methods could be employed. Non-lethal and lethal methods could be used under this alternative. WS would continue to provide technical assistance and/or direct operational assistance to those persons seeking assistance with managing damage or threats from predators. Risks to human safety from technical assistance conducted by WS would be similar to those risks addressed under Alternative 3. Those non-lethal methods that could be used as part of an integrated approach to managing damage that would be available for use by WS as part of direct operational assistance, would be similar to those risks associated with the use of those methods under the other alternatives.

Lethal methods available under Alternative 1 would include the use of euthanasia chemicals, cable devices, body-grip traps, shooting, fumigants (coyotes, red fox, striped skunks only), sodium cyanide (coyotes, fox, feral dogs only), and the recommendation of harvest during hunting and/or trapping seasons. In addition, target predators live-captured using non-lethal methods (*e.g.*, live-traps, immobilizing drugs) could be euthanized. Those lethal methods available under Alternative 1 or similar products would also be available under the other alternatives. None of the lethal methods available would be restricted to use by WS only, except sodium cyanide (M-44 devices). Euthanasia chemicals would have limited availability to the public but those predators live-captured could be killed using other methods. In addition, other entities could seek to register the use of sodium cyanide (M-44 devices) in the State.

WS' employees who conduct activities to manage damage caused by predators would be knowledgeable in the use of those methods available, the wildlife species responsible for causing damage or threats, those SOPs addressed in this EA, and WS' directives. WS' personnel in North Dakota would incorporate that knowledge into the decision-making process inherent with the WS Decision Model that employees would apply when addressing threats and damage caused by predators. When employing lethal methods, WS' employees would consider risks to human safety when employing those methods based on location and method. For example, risks to human safety from the use of methods would likely be lower in rural areas that are less densely populated. Personnel would also consider the location where they conduct damage management activities based on property ownership. If WS' personnel employed methods on private property in rural areas where access to the property could be controlled and monitored, the risks to human safety from the use of methods would likely be less. If damage management activities occurred at public parks or near other public use areas, then risks of the public encountering damage management methods and the corresponding risk to human safety would increase. Activities would generally be conducted when human activity was minimal (*e.g.*, early mornings, at night) or in areas where human activities was minimal (*e.g.*, remote rural areas, in areas closed to the public).

The use of live-capture traps, restraining devices (*e.g.*, foothold traps, some cable devices), and body-grip trap have been identified as a potential issue. Live-capture traps available for predators would typically be walk-in style traps where predators enter but are unable to exit. Live-traps, restraining devices, and body-grip traps would typically be set in situations where human activity was minimal to ensure public safety. Those methods rarely cause serious injury and only trigger through direct activation of the device. Therefore, human safety concerns associated with live traps, restraining devices, and body-grip traps used to capture wildlife, including predators, would require direct contact to cause bodily harm. Therefore, if left undisturbed, risks to human safety would be minimal. WS' personnel would prominently post signs

for public view at access points warning of the use of those tools in the area to increase awareness that those devices were present and to avoid the area, especially pet owners. In addition, the manager and/or the property owner would be aware that WS was using methods on their property, which provides the manager and/or the property owner the opportunity to alert guests using their property of the presence of methods.

Safety issues related to the misuse of firearms and the potential human hazards associated with the use of firearms were issues identified. To help ensure the safe use of firearms and to increase awareness of those risks, WS' employees who use firearms during official duties would be required to attend an approved firearm safety training course and to remain certified for firearm use must attend a safety training course in accordance with WS Directive 2.615. As a condition of employment, WS' employees who carry and use firearms are subject to the Lautenberg Domestic Confiscation Law, which prohibits firearm possession by anyone who has been convicted of a misdemeanor crime of domestic violence (18 USC § 922(g)(9)). A safety assessment based on site evaluations, coordination with cooperating and local agencies (if applicable), and consultation with cooperators would be conducted before firearms 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 WS' personnel consider safety issues before deeming firearms appropriate for use. The security of firearms would also occur pursuant to WS Directive 2.615.

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 could include immobilizing drugs, euthanasia chemicals, sodium cyanide (M-44 devices) (coyotes, fox, feral dogs only), gas cartridges (coyotes, fox, skunks only), and repellents.

WS' personnel would only administer immobilizing drugs to predators that were live-captured using other methods or they would administer the drugs through injection using a projectile (*e.g.*, dart gun). Personnel could use immobilizing drugs to temporarily sedate animals during handling and while transporting animals to lessen the distress of the animal from the experience. Drug delivery would likely occur on site with close monitoring of the animal to ensure proper care of the animal. Immobilizing drugs would be reversible with a full recovery of sedated animals occurring. Drugs used in capturing and handling wildlife that would be available include ketamine, a mixture of ketamine/Xylazine, and Telazol. Appendix B contains a list and description of immobilizing drugs available for use under the identified alternatives.

WS' personnel in North Dakota would administer euthanizing chemicals under similar circumstances to immobilizing drugs. Personnel could administer euthanasia chemicals to animals once those animals were live-captured using other methods. Euthanasia chemicals would include sodium pentobarbital, potassium chloride, and Beuthanasia-D. Euthanized animals would be disposed of in accordance with WS Directive 2.515; therefore, would not be available for harvest and consumption. Euthanasia of target animals would occur in the absence of the public to minimize risks, whenever possible.

The recommendation of repellents or the use of those repellents registered for use to disperse animals in the State could occur under Alternative 1 as part of an integrated approach to managing damage. Those chemical repellents that would be available to recommend for use or that could be directly used by WS under this alternative would also likely 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 of repellents by WS or the recommendation of repellents by WS is addressed under the technical assistance only alternative (Alternative 3). Risks to human safety 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 were 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.

The EPA (1994) “...does not anticipate significant environmental exposure to sodium cyanide when used as an encapsulated material together with the M-44 ejector device and when the directions specified on the label are followed”. In addition, the EPA (1994) stated, “The risk of cyanide poisoning from the current pesticidal uses to workers is minimal because of the current label restrictions” and the “...environmental impact of the pesticidal use of sodium cyanide is expected to be minimal because of its mode of application”. Those statements were re-affirmed by the EPA during a recent review of the registration of sodium cyanide in the M-44 device (EPA 2009).

The M-44 device, which contains sodium cyanide, is registered for use in North Dakota for WS personnel only. The EPA (1994) concluded that the encapsulated use of sodium cyanide in M-44 ejectors would pose minimal risks to the environment based on the use pattern and the degradation pattern of sodium cyanide. Sodium cyanide readily reacts with moisture and atmospheric carbon dioxide to produce hydrogen cyanide gas. If a spill occurs or when the ejector is fired, the reaction of the sodium cyanide with moisture and carbon dioxide produces hydrogen cyanide gas that would diffuse into the atmosphere and be diluted into the air (EPA 1994). Reactions with soil components convert sodium cyanide to carbon dioxide and ammonia or other nitrogen containing compounds (EPA 1994). Microorganisms are also known to decompose cyanide in soils by producing carbon dioxide and ammonia as end products. Therefore, the EPA (1994) determined that groundwater contamination by cyanide from M-44 ejectors was not anticipated. The EPA (1994) also determined that the risk of cyanide poisoning to the users of the M-44 device were mitigated by the label restrictions, the 26 specific use restrictions, and the restricted use classification of sodium cyanide.

To reduce risks to the public, signs warning of the placement of M-44 devices would be posted at property access points and at locations where the devices were deployed. The warning signs help to increase awareness that M-44 devices are deployed and for the public to avoid the area.

Gas cartridges could be available to fumigate burrows and den sites of coyotes, fox, and skunks in areas where damages were occurring. Gas cartridges act as a fumigant by producing carbon monoxide gas when ignited. The cartridges contain sodium nitrate, which when burnt, produces carbon monoxide gas. WS' personnel would place the cartridges inside active burrows and dens at the entrance, ignite the cartridge, and seal the entrance to the burrow or den with dirt, which allows the burrow or den to fill with carbon monoxide. The carbon monoxide would dissipate into the atmosphere and be diluted by the air (EPA 1991). WS' personnel would follow label instructions when employing gas cartridges. Therefore, no risks to human safety would occur from the use of gas cartridges.

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

HUMAN SAFETY CONSEQUENCES OF AERIAL WILDLIFE OPERATIONS ACCIDENTS

Beyond environmental consequences, other issues related to aviation accidents include the loss of aircraft and risks to the public and crewmembers. The use of aircraft by WS would be quite different from general aviation use. The environment in which WS would conduct aerial operations would be inherently a higher risk environment than that for general aviation. Low-level flights introduce hazards, such as power lines and trees, and the safety margin for error during maneuvers is higher compared to high-level flights. In 1998, the WS program commissioned an independent review of its aerial hunting operations because of several accidents. The panel made several recommendations to WS regarding enhanced aerial safety. The WS program implemented most all of those recommendations by 2001. WS has implemented an Aviation Safety Program to support aerial activities and recognizes that an aggressive overall safety and training program is the best way to prevent accidents. While the goal of the aviation program is to have no accidents, accidents may still occur, especially those involving mechanical failure. Pilots and contractors would be highly skilled with commercial pilot ratings that have passed proficiency tests in the flight environment encountered by the WS program. Pilots, gunners, and ground crews would be trained in hazard recognition and shooting would only be conducted in safe environments. Federal aviation regulations require pilots to fly a minimum distance of 500 feet from structures and people, and all employees involved in those operations would adhere to this requirement. Because of the remote locations in which the WS program conducts aerial operations, the risk to the public from aviation operations or accidents would be minimal.

EXECUTIVE ORDERS RELATING TO CHILDREN AND ENVIRONMENTAL JUSTICE

WS would use only legal, effective, and environmentally safe damage management methods, tools, and approaches. The EPA through the FIFRA, the NDDA, the United States Drug Enforcement Administration, MOUs, annual work plans with land managing agencies, and WS' directives would regulate chemical methods that could be available for use by WS pursuant to the alternatives (see WS Directive 2.401, WS Directive 2.405, WS Directive 2.430, WS Directive 2.465). WS would properly dispose of any excess solid or hazardous waste. WS does not anticipate the alternatives would result in any adverse or disproportionate environmental impacts to minority and low-income persons or populations. In contrast, the alternatives may benefit minority or low-income populations by reducing threats to public health and safety and property damage.

Children may suffer disproportionately for many reasons from environmental health and safety risks, including the development of their physical and mental status. 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. The proposed activities would occur by using only legally available and approved methods where it is highly unlikely that activities conducted pursuant to the alternatives would adversely affect children. For these reasons, WS concludes that it would not create an environmental health or safety risk to children from implementing the alternatives. Additionally, the need for action identified a need to reduce threats to human safety, including risks to children; therefore, cooperators could request WS' assistance with reducing threats to the health and safety of children posed by predators.

No adverse effects to human safety have occurred from WS' use of methods to alleviate predator damage in the State from FY 2009 through FY 2014. The risks to human safety from the use of non-lethal and lethal methods, when used appropriately and by trained personnel, would be considered low. Based on the use patterns of methods available to address damage caused by predators, this alternative would comply with Executive Order 12898 and Executive Order 13045.

Alternative 2 – WS Would Address Predator Damage through an Adaptive Integrated Approach Using Only Non-lethal Methods

A non-lethal management alternative would require the WS program to only recommend and use non-lethal methods to manage and prevent damage caused by predators. WS would provide technical assistance and direct operational assistance under this alternative recommending and using only non-lethal methods. Similar to the other alternatives, other entities could and would likely continue to use lethal methods and those activities could increase in proportion to the reduction of assistance using lethal methods provided by the WS program. Threats to human safety would continue to occur from activities conducted by other entities, including from those people who implement damage management activities on their own similar to Alternative 3 and Alternative 4.

Non-lethal methods recommended or employed by the WS program have the potential to threaten human safety. Threats to human safety associated with non-lethal methods that would be available under this alternative were addressed under Alternative 1. The threats to human safety associated with non-lethal methods under this alternative would be the same as those threats addressed under Alternative 1. The recommendation and use of non-lethal methods by WS would comply with Executive Order 12898 and Executive Order 13045 under this alternative.

Other entities could still provide assistance using lethal methods under this alternative. Those entities would likely continue to employ those lethal methods discussed in Appendix B. If the assistance using lethal methods provided by those entities increased in proportion to assistance that the WS program would have provided using lethal methods, the potential threats to human safety from methods available would be similar to other alternatives. If those entities increase assistance using lethal methods in proportion to the assistance that the WS program would have provided, risks would be similar to Alternative 1. This could result in less experienced persons implementing lethal methods and could lead to greater risks to human safety. Other entities could use lethal methods where the personnel of the WS program may not because WS' personnel would follow those SOPs outlined in Chapter 3 to reduce threats to human safety. Lethal methods employed by those persons not experienced in the use of methods or were not trained in their proper use, could increase threats to human safety. The NDGFD could continue to issue permits to shoot certain predator species from aircraft under this alternative.

Alternative 3 – Predator Damage Management by WS through Technical Assistance Only

Under this alternative, WS would be restricted to making recommendations on the use of methods and the demonstration of methods to resolve damage. WS would only provide technical assistance to those people requesting assistance with damage and threats caused by predators. Although hazards to human safety from non-lethal methods exist, those methods are generally regarded as safe when used by trained individuals who are experienced in their use. Risks to human safety associated with non-chemical methods, such as exclusion, guard animals, limited habitat management, animal husbandry, frightening devices, and cage traps, could be considered low based on their use profile for alleviating damage associated with wildlife. Although some risk of fire and bodily harm exists from the use of pyrotechnics and propane cannons, when used appropriately and in consideration WS could recommend the use of those risks, those methods could be used with a high degree of safety.

Under a technical assistance only alternative, the availability of immobilizing drugs, euthanasia chemicals, and aircraft to those persons experiencing damage or other entities would be limited. Immobilizing drugs and euthanasia chemicals used in capturing and handling wildlife could be administered under the direction and authority of state veterinary authorities, either directly or through procedures agreed upon between those authorities and other entities, such as the NDGFD. Without access to immobilizing drugs or euthanizing chemicals, those persons capturing predators using live-traps or

other live-capture methods would be responsible for euthanizing or handling live-captured captive animals. Since the availability of immobilizing drugs and euthanizing chemicals would be limited under this alternative, a gunshot would likely be the primary method of euthanasia. The use of aircraft, primarily the use of firearms from an aircraft, would require a permit from the NDGFD. Sodium cyanide (M-44 devices) would not be available for use under this alternative since the use of sodium cyanide is currently restricted to use by WS' personnel only in the State. However, if WS was not available to provide direct operational assistance under this alternative, other entities could pursue registering sodium cyanide (M-44 devices) in the State.

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

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

If non-chemical methods were employed according to recommendations and as demonstrated by WS, the potential risks to human safety would be similar to Alternative 1. If methods were employed without guidance from WS or applied inappropriately, the risks to human safety could increase. The extent of the increased risk would be unknown and variable. Non-chemical methods inherently pose minimal risks to human safety given the design and the extent of the use of those methods.

The cooperator requesting assistance would also be made aware of threats to human safety associated with the use of those methods. SOPs for methods are discussed in Chapter 3 of this EA. Risks to human safety from activities and methods recommended under this alternative would be similar to the other alternatives since the same methods would be available. If misused or applied inappropriately, any of the methods available to alleviate predator damage could threaten human safety. However, when used appropriately, methods available to alleviate damage would not threaten human safety. The recommendation of methods by WS to people requesting assistance and the pattern of use recommended by WS would comply with Executive Order 12898 and Executive Order 13045.

Alternative 4 - No Predator Damage Management Conducted by WS

Under the no involvement by WS alternative, WS would not provide assistance with managing damage associated with predators in the State, including technical assistance. Due to the lack of involvement in managing damage caused by predators, no impacts to human safety would occur directly from WS. This alternative would not prevent those entities experiencing threats or damages associated with predators from conducting damage management activities in the absence of WS' assistance. The direct burden of

implementing permitted methods would be placed on those people experiencing damage or would require those people to seek assistance from other entities.

Similar to the technical assistance only alternative, immobilizing drugs, euthanasia chemicals, and the use of aircraft would have limited availability under this alternative to the public. Sodium cyanide (M-44 device) would not be available for use under this alternative since only WS' personnel can currently use those devices. However, in the absence of WS' involvement, other entities could pursue the registration of sodium cyanide in the State. Since most methods available to resolve or prevent predator damage or threats would be available to anyone, the threats to human safety from the use of those methods would be similar between the alternatives. However, methods employed by those persons not experienced in the use of methods or were not trained in their proper use, could increase threats to human safety. Overall, the methods available to the public, when applied correctly and appropriately, would pose minimal risks to human safety.

Issue 4 – Humaneness and Animal Welfare Concerns of Methods

As discussed previously, a common issue often raised is concerns about the humaneness of methods available under the alternatives for resolving predator damage and threats. Discussion of method humaneness for those methods available under the alternatives occurs below.

Alternative 1 - Continue the Current Adaptive Integrated Methods Approach to Managing Predator Damage (No Action/Proposed Action)

Under Alternative 1, WS would integrate methods using the WS Decision Model as part of technical assistance and direct operational assistance. Methods available under Alternative 1 could include non-lethal and lethal methods integrated into direct operational assistance conducted by WS. Under this alternative, WS' personnel would use non-lethal methods that people generally regard as humane. Non-lethal methods that would be available include resource management methods (*e.g.*, limited habitat modification, modification of human behavior), translocation, exclusion devices, frightening devices, cage traps, foothold traps, immobilizing drugs, and repellents.

As discussed previously, humaneness, in part, appears to be a person's perception of harm or pain inflicted on an animal. People may perceive the humaneness of an action differently. Schmidt and Brunson (1995) conducted a public attitude survey in which respondents were asked to rate a variety of methods on humaneness based on their individual perceptions of the methods. Schmidt and Brunson (1995) found that the public believes that the non-lethal methods, such as animal husbandry, fences, and scare devices, were the most humane and traps, snares, and shooting from aircraft was the least humane. The challenge in coping with this issue is how to achieve the least amount of animal suffering.

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

Some methods have been stereotyped as “*humane*” or “*inhumane*”. However, many “*humane*” methods can be inhumane if not used appropriately. For instance, a cage trap would generally be considered by most members of the public as “*humane*”, since the animal would be alive and generally unharmed. Yet, without proper care, live-captured wildlife in a cage trap could be treated inhumanely if not attended to appropriately.

Therefore, the goal would be to address requests for assistance effectively using methods in the most humane way possible that minimizes the stress and pain to the animal. Overall, the use of resource management methods, harassment methods, and exclusion devices would be regarded as humane when used appropriately. Although some concern arises from the use of live-capture methods, the stress of animals is likely temporary.

Although some issues of humaneness could occur from the use of cage traps, foothold traps, translocation, and immobilizing drugs, those methods, when used appropriately and by trained personnel, would not result in the inhumane treatment of wildlife. Concerns from the use of those non-lethal methods would be from injuries to animals while those animals were restrained and from the stress of the animal while being restrained or during the application of the method. Pain and physical restraint can cause stress in animals and the inability of animals to effectively deal with those stressors can lead to distress. Suffering occurs when action is not taken to alleviate conditions that cause pain or distress in animals.

If predators were to be live-captured by WS, WS’ personnel would be present on-site during capture events or capture devices would be checked frequently to ensure predators captured were addressed in a timely manner and to prevent injury. Although stress could occur from being restrained, timely attention to live-captured wildlife would alleviate suffering. Stress would likely be temporary.

Under Alternative 1, lethal methods could also be employed to alleviate or prevent predator damage and threats, when requested. Lethal methods would include shooting, body-gripping traps, cable devices, euthanasia chemicals, fumigants (coyotes, red fox, striped skunks only), sodium cyanide (coyotes, fox, feral dogs only), and the recommendation of harvest during the hunting and/or trapping season. In addition, predators that are live-captured using non-lethal methods could be euthanized by WS. WS’ use of lethal control methods under Alternative 1 would follow those required by WS’ directives (see WS Directive 2.505, WS Directive 2.430).

The euthanasia methods being considered for use under Alternative 1 for live-captured predators are carbon dioxide, carbon monoxide, gunshot, and barbiturates or potassium chloride in conjunction with general anesthesia. Those methods are considered acceptable methods by the AVMA for euthanasia and the use of those methods would meet the definition of euthanasia (AVMA 2013). The use of carbon dioxide, carbon monoxide, barbiturates, and potassium chloride for euthanasia would occur after the animal had been live-captured and would occur away from public view. Although the AVMA guideline also lists gunshot as a conditionally acceptable method of euthanasia for free-ranging wildlife, there is greater potential the method may not consistently produce a humane death (AVMA 2013). WS’ personnel that employ firearms to address predator damage or threats to human safety would be trained in the proper placement of shots to ensure a timely and quick death.

Research and development by WS has improved the selectivity and humaneness of management techniques. Research is continuing to bring new findings and products into practical use. Until new findings and products were found practical, a certain amount of animal suffering could occur when some methods were used in situations where non-lethal damage management methods were not practical or effective. As stated previously, research suggests that some methods, such as restraint in foothold traps or changes in the blood chemistry of trapped animals, indicate “*stress*” (Kreeger et al. 1990). However, such

research has not yet progressed to the development of objective, quantitative measurements of pain or stress for use in evaluating humaneness (Bateson 1991, Sharp and Saunders 2008, Sharp and Saunders 2011).

Personnel from WS would be experienced and professional in their use of management methods (see WS Directive 1.301). Consequently, management methods would be implemented in the most humane manner possible. Many of the methods discussed in Appendix B to alleviate predator damage and/or threats in the State could be used under any of the alternatives by those persons experiencing damage regardless of WS' direct involvement. Most of the methods discussed in Appendix B to alleviate predator damage and/or threats could be used under any of the alternatives by those persons experiencing damage or their agents regardless of involvement by WS. Therefore, the issue of humaneness associated with methods would be similar across any of the alternatives since those methods could be employed by other entities in the absence of WS' involvement. Those persons who view a particular method as humane or inhumane would likely continue to view those methods as humane or inhumane under any of the alternatives. SOPs that would be incorporated into WS' activities to ensure methods were used by WS as humanely as possible are listed in Chapter 3.

Alternative 2 – WS Would Address Predator Damage through an Adaptive Integrated Approach Using Only Non-lethal Methods

Under this alternative, the WS program would only use non-lethal methods, which most people would generally regard as humane. Non-lethal methods would include resource management methods (*e.g.*, minor habitat modification, modification of human behavior), translocation, exclusion devices, frightening devices, live traps, foothold traps, cable devices, and repellents.

Although some issues of humaneness could occur from the use of non-lethal methods, those methods, when used appropriately and by trained personnel, would not result in the inhumane treatment of predators. Concerns from the use of those non-lethal methods would be from injuries to animals while restrained, from the stress of the animal while being restrained, or during the application of the method. Pain and physical restraint can cause stress in animals and the inability of animals to effectively deal with those stressors can lead to distress. Suffering occurs when people do not take action to alleviate conditions that cause pain or distress in animals.

Overall, many people would regard the use of resource management methods, harassment methods, live-capture methods, and exclusion devices as humane when used appropriately. Although some concern arises from the use of live-capture methods, the stress of animals would likely be temporary and would cease once a person released the animal. Similar to the other alternatives, other entities could continue to use lethal methods under this alternative.

Alternative 3 – Predator Damage Management by WS through Technical Assistance Only

The issue of method humaneness under this alternative would be similar to the humaneness issues discussed under Alternative 1. This similarity would be derived from WS' recommendation of methods that some people may consider inhumane. WS would not directly be involved with damage management activities under this alternative. However, the recommendation of the use of methods would likely result in the requester employing those methods. Therefore, by recommending methods and thus a requester employing those methods, the issue of humaneness would be similar to Alternative 1. Under Alternative 3, WS would recommend the use of euthanasia methods pursuant to WS Directive 2.505. However, the person requesting assistance would determine what methods to use to euthanize or kill a live-captured animal under Alternative 3.

WS would instruct and demonstrate the proper use and placement of methodologies to increase effectiveness in capturing target predators and to ensure methods were used in such a way as to minimize pain and suffering. However, the efficacy of methods employed by a cooperators would be based on the skill and knowledge of the requester in resolving the threat to safety or damage situation despite WS' demonstration. Therefore, a lack of understanding of the behavior of predators or improperly identifying the damage caused by predators along with inadequate knowledge and skill in using methodologies to resolve the damage or threat could lead to incidents with a greater probability of being perceived as inhumane. In those situations, the potential for pain and suffering would likely be regarded as greater than discussed in Alternative 1.

Alternative 4 - No Predator Damage Management Conducted by WS

Under this alternative, WS would not be involved with any aspect of predator damage management in North Dakota. Those people experiencing damage or threats associated with predators could continue to use those methods legally available. Those persons who would consider methods to be inhumane would likely consider those methods to be inhumane under any alternative. The issue of humaneness would likely be directly linked to the methods legally available to the public since methods are often labeled as inhumane by segments of society no matter the entity employing those methods.

The humaneness of methods would be based on the skill and knowledge of the person employing those methods. A lack of understanding regarding the behavior of predators or methods used could lead to an increase in situations perceived as being inhumane to wildlife despite the method used. Despite the lack of involvement by WS under this alternative, those methods perceived as inhumane by certain individuals and groups would still be available to the public to use to resolve damage and threats caused by predators. Those persons employing methods to live-capture predators would determine when and how to euthanize or kill those animals.

4.3 CUMULATIVE IMPACTS OF ALTERNATIVE 1 BY ISSUE

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

Under Alternative 1, Alternative 2, and Alternative 3, the WS program would address damage associated with predators either by providing technical assistance only (Alternative 3) or by providing technical assistance and direct operational assistance (Alternative 1, Alternative 2) across the State. The WS program would be the primary federal agency conducting direct operational predator damage management in the State under Alternative 1, Alternative 2, and Alternative 3. However, other federal, state, and private entities could also be conducting predator damage management in the State.

WS does not normally conduct direct damage management activities concurrently with other agencies or other entities in the same area, but may conduct damage management activities at adjacent sites within the same period. In addition, commercial companies may conduct damage management activities in the same area. The potential cumulative impacts could occur from either damage management activities over time by WS or from the aggregate effects of those activities combined with the activities of other agencies and

private entities. Damage management activities in the State would be monitored by WS to evaluate and analyze activities to ensure they were within the scope of analysis of this EA.

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

The issue of the effects on the statewide predator population arises from the use of non-lethal and lethal methods to address the need for reducing damage and threats. As part of an integrated methods approach to managing damage and threats, WS could apply both lethal and non-lethal methods when requested by those persons experiencing damage.

Non-lethal methods could disperse or otherwise make an area unattractive to predators causing damage; thereby, reducing the presence of predators at the site and potentially the immediate area around the site where non-lethal methods were employed. WS' employees would give non-lethal methods priority when addressing requests for assistance (see WS Directive 2.101). However, WS would not necessarily employ non-lethal methods to resolve every request for assistance if deemed inappropriate by WS' personnel using the WS Decision Model. For example, if a cooperators requesting assistance, had already attempted to disperse predators using non-lethal harassment methods, WS would not necessarily employ those methods again during direct operational assistance since those methods had already been proven to be ineffective in that particular situation. WS and other entities could use non-lethal methods to exclude, harass, and disperse target wildlife from areas where damage or threats were occurring. When effective, non-lethal methods would disperse predators from an area resulting in a reduction in the presence of those predators at the site where WS or another entity employed those methods. However, predators responsible for causing damage or threats would likely disperse to other areas with minimal impacts occurring to predator populations. WS would not employ non-lethal methods over large geographical areas or apply those methods 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. WS and most people generally regard non-lethal methods as having minimal impacts on overall populations of wildlife since individuals of those species would be unharmed. Therefore, the use of non-lethal methods would not have cumulative effects on predator populations in the State.

WS' employees could employ lethal methods to resolve damage associated with predators that WS identifies as responsible for causing damage or threats to human safety. However, lethal removal by WS would only occur after receiving a request for such assistance. Therefore, the use of lethal methods could result in local reductions in the number of target animals in the area where damage or threats were occurring since WS would remove those target individuals from the population. WS would often employ lethal methods to reinforce non-lethal methods and to remove predators that have been identified as causing damage or posing a threat to human safety. The use of lethal methods could therefore result in local reductions of predators in the area where damage or threats were occurring. The number of predators removed from the predator population using lethal methods under Alternative 1 would be dependent on the number of requests for assistance received, the number of predators involved with the associated damage or threat, and the efficacy of methods employed.

WS would maintain ongoing contact with the NDGFD to ensure activities were within management objectives for wildlife. WS would submit annual activity reports to the NDGFD. The NDGFD would have the opportunity to monitor the total removal of wildlife from all sources and could factor in survival rates from predation, disease, and other mortality data.

WS and the NDGFD would monitor removal by comparing the number of predators killed with overall populations or trends in populations to assure the magnitude of removal was below the level that would cause undesired adverse effects to the viability of native wildlife populations. This EA analyzed the

potential cumulative impacts on the predator population from the implementation of Alternative 1 in Section 4.2.

Evaluation of activities relative to target species indicated that program activities would likely have no cumulative adverse effects on predator populations when targeting those individual animals responsible for damage at the levels addressed in this EA. WS' actions would be occurring simultaneously, over time, with other natural processes and human generated changes that are currently taking place (*e.g.*, see Collins and Kays 2011). These activities include, but would not be limited to:

- Natural mortality of animals
- Mortality through vehicle strikes, aircraft strikes, and illegal harvest
- Human-induced mortality from annual hunting and/or trapping seasons for predator species
- Human-induced mortality of predators through private damage management activities
- Human and naturally induced alterations of wildlife habitat
- Annual and perennial cycles in animal population densities

All those factors play a role in the dynamics of predator populations. In many circumstances, requests for assistance arise when some or all of those elements have contrived to elevate target species populations or place target species at a juncture to cause damage to resources. The actions taken to minimize or eliminate damage would be constrained as to scope, duration, and intensity for the purpose of minimizing or avoiding impacts to the environment. WS' personnel would use the Decision Model to evaluate the damage occurring, including other affected elements and the dynamics of the damaging species, to determine appropriate strategies to minimize effects on environmental elements. The Model would allow WS' personnel to implement damage management actions and to monitor those actions to adjust/cease damage management actions, which would allow WS to take into consideration other influences in the environment, such as those listed above, in order to avoid cumulative effects on target species (Slate et al. 1992).

With management authority over wildlife populations in the State, the NDGFD could adjust removal levels, including the removal of WS, to ensure population objectives for wildlife were achieved. Consultation and reporting of removal by WS would ensure the NDGFD had the opportunity to consider any activities WS conducts.

WS' removal of predators in North Dakota, from FY 2009 through FY 2014, was of a low magnitude when compared to the statewide population of those species (see Appendix D). The NDGFD could consider all known removal when determining population objectives for wildlife and could adjust the number of individuals from a wildlife species that could be harvested during the regulated harvest season and the number of animals removed for damage management purposes to achieve the population objectives. Any removal by WS would occur at the discretion of the NDGFD. Therefore, the cumulative removal of predators annually or over time by WS would occur at the desire of the NDGFD as part of management objectives for predators in North Dakota. No cumulative adverse effects on target and non-target wildlife would be expected from WS' damage management activities based on the following considerations:

Historical Outcomes of WS' Damage Management Activities on Wildlife

WS would conduct damage management activities associated with predators only at the request of a cooperator to reduce damage that was occurring or to prevent damage from occurring and only after methods to be used were agreed upon by all parties involved. WS would monitor activities to ensure any potential impacts were identified and addressed. WS would work closely with resource agencies to

ensure damage management activities would not adversely affect predator populations and that WS' activities were considered as part of management goals established by those agencies. Historically, WS' activities to manage damage caused by predators in North Dakota have not reached a magnitude that would cause adverse effects to those species' populations in the State (see Appendix D).

SOPs Built into the WS Program

SOPs are designed to reduce the potential negative effects of WS' actions on predators, and have been tailored to respond to changes in wildlife populations that could result from unforeseen environmental changes (see Section 3.3, Section 3.4). This would include those changes occurring from sources other than WS. Alteration of activities would be defined through SOPs, and implementation would be insured through monitoring, in accordance with the WS Decision Model (see WS Directive 2.201; Slate et al. 1992) and close coordination with NDGFD.

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

Potential effects on non-target species from conducting activities arise from the use of non-lethal and lethal methods to alleviate or prevent damages. The use of non-lethal methods has the potential to exclude, disperse, or capture non-target animals. However, the effects of non-lethal methods are often temporary and often do not involve the removal of non-target animals. When using exclusion devices and/or repellents, both target and non-target wildlife can be prevented from accessing the resource being damaged. Since exclusion and repellents do not involve lethal removal, cumulative impacts on non-target species from the use of exclusionary methods or repellents would not occur but would likely disperse those individuals to other areas. Exclusionary methods and repellents can require constant maintenance to ensure effectiveness. Therefore, the use of some exclusionary devices and repellents would be somewhat limited to small, high-value areas and not used to the extent that non-targets would be excluded from large areas that would cumulatively impact populations from the inability to access a resource, such as potential food sources or denning sites. The use of visual and auditory harassment and dispersion methods would generally be temporary with non-target species returning after the cessation of those activities. Dispersal and harassment do not involve the removal (killing) of non-target species and similar to exclusionary methods would not be used to the extent or at a constant level that would prevent non-targets from accessing critical resources that would threaten survival of a population.

The use of lethal methods or those methods used to live-capture target species followed by euthanasia also have the potential to affect non-target animals through the removal (killing) or capture of non-target species. Capture methods used are often methods that would be set to confine or restrain target animals after being triggered by a target individual. Capture methods would be employed in such a manner as to minimize the threat to non-target species by placement in those areas frequently used by target wildlife, using baits or lures that were as species specific as possible, and modification of individual methods to exclude non-targets from capture. Most methods described in Appendix B are methods that would be employed to confine or restrain wildlife that would be subsequently euthanized using humane methods. With all live-capture devices, non-target wildlife captured could be released on site if determined to be able to survive following release. SOPs are intended to ensure removal of non-target animals was minimal during the use of methods to capture target animals.

The use of firearms and euthanasia methods would essentially be selective for target species since identification of an individual would be made prior to the application of the method. Euthanasia methods would be applied through direct application to target wildlife. Therefore, the use of those methods would not affect non-target species.

All chemical methods would be tracked and recorded to ensure the proper accounting of used and unused chemicals (see WS Directive 2.465). All chemicals would be stored and transported according with WS' Directives and relevant federal, state, and local regulations. Chemical methods available for use under Alternative 1 would include immobilizing drugs, euthanasia chemicals, sodium cyanide (coyotes, fox, feral dogs only), gas cartridges (coyotes, fox, skunks only), and repellents, which are described in Appendix B. Immobilizing drugs and euthanasia chemicals would be applied directly to target animals; therefore, risks to non-targets would be minimal. Repellents would be applied directly to the affected resources with the intent of dispersing animals or discouraging animals from feeding on the resources. Although repellents could disperse or discourage non-target animals, no adverse effects to those species populations would occur. M-44 devices use baits/lures that are highly attractive to target species to minimize risks to non-targets. Gas cartridges would only be used in burrow/den sites of target animals that were active. Chemical methods would generally be placed in areas where exposure to non-targets would be minimal. All chemicals would be used according to product labels, which would ensure that proper use would minimize non-target threats. WS' adherence to Directives and SOPs governing the use of chemicals would also ensure non-target hazards would be minimal.

The methods described in Appendix B have a high level of selectivity and could be employed using SOPs to ensure minimal impacts to non-target species. The unintentional removal of animals would likely be limited and would not reach a magnitude where adverse effects would occur. In addition, some of the species lethally removed by WS as unintentional non-target animals can be harvested during annual hunting and/or trapping seasons. Based on the methods available to resolve predator damage and/or threats, WS does not anticipate the number of non-target animals lethally removed to reach a magnitude where declines in those species' populations would occur. Therefore, removal of non-target animals would not cumulatively affect non-target species.

Concerns have been expressed that WS' activities disrupt trophic cascades or cause mesopredator release by eliminating or substantially reducing top predators (Bergstrom et al. 2014). WS has reviewed those concerns relative to the implementation of the alternatives. WS only conducts activities when and where those activities are permitted, needed, and requested by other entities. When providing assistance, WS' personnel focus on dispersing, capturing, or removing specific animals or local group of animals that are causing damage or posing a threat of damage. WS does not strive to eliminate or remove native predators from any area on a long-term basis. Consequently, no predators or prey would be extirpated and none would be introduced into an ecosystem. Any dispersal or removal of animals would generally be temporary and would occur in relatively small or isolated geographic areas when compared with the overall population of a species. Therefore, WS concludes that implementation of the alternatives would not cause significant negative ecological impacts with respect to apex predators, biodiversity, ecosystem resilience, ecosystem services, mesopredator release, or trophic cascades.

WS has reviewed the T&E species listed by the USFWS and conducted consultations pursuant to the ESA. WS would continue to abide by all reasonable and prudent measures, including the terms and conditions that implement the reasonable and prudent measures, as outlined in the biological opinion issued by the USFWS to avoid jeopardizing the status of the gray wolf (see Appendix C). Cumulative impacts would be minimal on non-targets from any of the alternatives discussed.

Issue 3 - Effects of Damage Management Methods on Human Safety

Non-chemical methods described in Appendix B would be used within a limited period, would not be residual, and do not possess properties capable of inducing cumulative effects on human health and safety. WS' personnel would use non-chemical methods after careful consideration of the safety of those persons employing methods and to the public. When possible, WS' personnel would use capture methods where human activity was minimal to ensure the safety of the public. Capture methods also require direct

contact to trigger, which ensures that those methods, when left undisturbed, would have no effect on human safety. WS' personnel would only use methods the requester agreed to when signing a MOU, work initiation document, or another comparable document. Therefore, WS' personnel would make those entities requesting assistance aware of the safety issues of those methods when entering into a MOU, work initiation document, or another comparable document. SOPs would also ensure the safety of the public from those methods used to capture or remove wildlife. WS' personnel would use firearms in situations that ensure the safety of employees and the public.

Personnel employing non-chemical methods would continue to receive training to be proficient in the use of those methods to ensure the safety of the applicator and to the public. Based on the use patterns of non-chemical methods, those methods would not cumulatively affect human safety.

Repellents to disperse predators from areas of application would be available. Repellents must be registered with the EPA according to the FIFRA and with the NDDA. Many of the repellents currently available for use have active ingredients that are naturally occurring and are generally regarded as safe. Although some hazards exist from the use of repellents, hazards occur primarily to the handler and applicator. When repellents were applied according to label requirements, no effects to human safety would be expected. Similarly, fumigants must also be registered for use with the EPA and the NDDA. Given the use patterns of repellents and fumigants, no cumulative effects would occur to human safety.

The WS program in North Dakota has received no reports or documented any effects to human safety from damage management activities conducted from FY 2009 through FY 2014. WS does not expect any cumulative effects from the use of those methods discussed in Appendix B given the use patterns of those methods for resolving predator damage in North Dakota.

Issue 4 – Humaneness and Animal Welfare Concerns of Methods

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

All methods not requiring direct supervision during employment (*e.g.*, live traps) would be checked in accordance with North Dakota laws and regulations to ensure any wildlife confined or restrained were addressed in a timely manner to minimize distress of the animal. WS' personnel would apply euthanasia methods according to WS' directives. Shooting would occur in some situations and WS' personnel would receive training in the proper use of firearms to minimize pain and suffering of predators removed by this method.

WS would employ methods as humanely as possible by applying SOPs to minimize pain. In addition, WS' personnel would address animals live-captured in a timely manner to minimize distress. Through the establishment of SOPs that guide WS in the use of methods, the cumulative impacts on the issue of method humaneness would be minimal. WS would continually evaluate methods to ensure SOPs were adequate and that WS' personnel address live-captured animals in a timely manner to minimize distress.

CHAPTER 5: RESPONSES TO PUBLIC COMMENTS

5.1 SUMMARY OF PUBLIC COMMENTS AND WS' RESPONSES TO THE COMMENTS

WS made the EA available to the public for review and comment through notices published in local media and through direct notification of interested parties. WS made the EA available to the public for

review and comment by a legal notice published in the *Bismarck Tribune* newspaper from October 17, 2016 through October 19, 2016 and *The Forum* newspaper on October 24, 2016 and October 31, 2016. WS also made the EA available to the public for review and comment on the APHIS website on October 12, 2016 and on the regulations.gov website beginning on October 12, 2016. WS also sent a notice of availability directly to agencies, organizations, and individuals with probable interest in managing predator damage in the State. The public involvement process ended on December 2, 2016. During the public comment period, WS received two comment responses on the draft EA. Chapter 5 summarizes the comments received and provides WS' response to the comments.

Comment 1 – WS must follow federal regulations while weighing the public's values concerning wildlife

Response: As the commenter acknowledges, the public can hold “*widely divergent standards around wildlife*”, which the EA also acknowledges and discusses in Section 1.1 and Section 1.2 of the EA. In addition, the EA discusses the potential effects on the public's aesthetic enjoyment of predators (see Section 4.2) and the potential effects on recreational activities, including consumptive activities and non-consumptive activities (see Section 4.2). In addition, the WS program would only provide assistance when the appropriate landowner or manager requests such assistance and only on properties where WS and the entity requesting assistance signed a MOU, work initiation document, work plan, or another comparable document. When predator damage exceeds or threatens to exceed an economic threshold and/or pose a threat to human health and safety, people often seek assistance. The threshold triggering a request for assistance is often unique to the individual person requesting assistance and many factors can influence when people request assistance (e.g., economic, social, aesthetics). Therefore, what constitutes damage is often unique to the individual person. What one individual person considers damage, another person may not consider as damage. As discussed in Section 3.1, the WS Decision Model (see WS Directive 2.201) described by Slate et al. (1992) depicts how WS' personnel would use a thought process for evaluating and responding to requests for assistance. WS' personnel would assess the problem and then evaluate the appropriateness and availability (legal and administrative) of strategies and methods based on biological, economic, and social considerations (see Section 3.1). As discussed in Section 1.6, the WS program in North Dakota would comply with applicable federal, state, and local laws and regulations in accordance with WS Directive 2.210. Therefore, WS follows federal regulations while weighing the values of the public concerning wildlife, which the EA acknowledges and discusses.

Comment 2 – There is no purpose or need for indiscriminate predator control in North Dakota

Response: As discussed throughout the EA, the activities that WS could conduct in North Dakota pursuant to the relevant alternatives would only target those predators that WS' personnel have identified as causing damage or posing a threat of damage. As indicated in Section 3.4, an SOP that WS would incorporate into the implementation of a relevant alternative would be that WS' personnel would only target those individual animals or groups of animals identified as causing damage or posing a threat of damage. In addition, WS only provides assistance after receiving a request for assistance (see discussion on WS' Decision Making Procedures in Section 3.1). Therefore, the indiscriminate control of predators would not occur by the WS program in the North Dakota.

Comment 3 – WS exaggerates livestock losses in the EA; WS fails to demonstrate the need given the small number of livestock killed by animals compared to livestock inventories

The commenter mischaracterizes information in the EA regarding animal predation of livestock in the United States. The EA states, “*In 2010, the NASS (2011) reported cattle and calf losses from animal predation totaled 219,900 head in the United States according to livestock producers. Animal predation represented 5.5% of the total cattle and calf losses reported by livestock producers in 2010 totaling \$98.5*

million in economic losses” [emphasis added], which accurately reflects the findings of the NASS (2011). The commenter states, “*The loss of cattle and calves in the United States was less than one percent of the total inventory, not the 5.5% that WS claims*”. The commenter is comparing the total inventory of cattle and calves in the United States while the statement in the EA presents the finding of the NASS (2011) associated with “*total cattle and calf losses*”. Therefore, WS did not exaggerate the livestock losses in the EA and the EA accurately reflects the findings of the NASS (2011).

In addition, an issue identified during the scoping process of the EA was a concern that WS should not provide any assistance or should limit assistance to certain methods (*e.g.*, non-lethal only methods) when livestock losses are low compared to the losses from other sources. This discussion occurs under the heading “*Livestock Losses are Low When Compared to Losses from Other Sources and Other Factors*” in Section 2.3. WS and the NDGFD also considered an alternative that would require the establishment of a loss threshold by WS before allowing WS’ personnel to use lethal methods; however, WS and the NDGFD did not consider the alternative in detail for the reasons provided in Section 3.2 of the EA. As discussed in Section 1.2, the need for action to manage damage and threats associated with predators in North Dakota arises from requests for assistance received by the WS program from individual people; therefore, the basis for the need is not the total number of livestock lost due to predatory animals comparative to the total livestock inventory in the State.

Comment 4 – WS should conduct verification and forensic analysis for livestock losses

As the EA states in Section 1.2, WS’ personnel attempt to verify sufficient livestock losses to establish a need for managing damage. WS’ personnel often inspect a livestock carcass to determine the cause of death to establish a need to manage damage caused by predators. However, in some circumstances, verifying all losses and the cause of those losses can be difficult due to many factors, such as the remoteness of areas where potential losses occurred, the need to search a large area for livestock carcasses, the amount of time between losses, and the condition of the livestock carcasses. For example, a livestock producer may report the loss of two calves from predator losses but the death of one calf occurred two weeks prior to contacting WS. WS’ personnel may only verify a predator killed one of the calves to establish a need to assist the livestock producer because the cause of death of the second calf may not be determinable after two weeks. In those situations, WS’ data would reflect verified losses (*i.e.*, a loss that WS’ personnel verify as predation) and reported losses (*i.e.*, a loss reported by the livestock producer). The WS program often uses loss reports to provide an index of the annual losses and not necessary to reflect actual losses occurring. Therefore, WS’ personnel do conduct verification and forensic analysis for livestock losses to establish a need for managing damage.

Comment 5 - WS failed to meaningfully address cumulative impacts in the EA

Response: The commenter claims the EA inadequately addresses the cumulative effects of hunting, trapping, and other mortality on wildlife populations in the State and the diminished habitats from oil and gas drilling. In addition, the commenter claims the EA inadequately addresses the cumulative effects of climate change on wildlife populations. However, the EA does meaningfully address the cumulative effects of mortality on populations in the EA, including the potential effects that could occur from oil and gas drilling the State. As discussed in Section 1.5, the NDGFD has management responsibility for resident wildlife species in North Dakota, except migratory birds and federally listed threatened or endangered species. The mission of the NDGFD “*...is to protect, conserve, and enhance fish and wildlife populations and their habitat for sustained public consumptive and nonconsumptive use*”. To determine the magnitude of impacts in relation to predators and their populations, the NDGFD analyzed data and known cumulative lethal removal of predators during the development of the EA (see Appendix D). In addition, during the development of the EA, the cumulative effects associated with oil and gas development and other human exploitation was an issue that WS and the NDGFD identified but the EA

did not address the issue in detail for the reasons provided in Section 2.3. As discussed in Section 2.3, WS and the NDGFD can evaluate and adjust activities as changes occur over time by monitoring activities conducted by WS. Accordingly, WS and the NDGFD could supplement this analysis or conduct a separate evaluation pursuant to the NEPA based on the review and consultation processes. Therefore, the activities conducted by WS would be responsive to ongoing changes and the associated cumulative impacts of actions conducted in North Dakota in accordance with the NEPA.

Comment 6 - The EA failed to meaningfully address site-specific impacts in North Dakota

Response: The EA addressed site specificity in Section 1.3 and the issue of WS conducting a site-specific analysis for every location where activities occur was an issue that WS and the NDGFD identified during the scoping process for the EA (see Section 2.3). However, WS and the NDGFD did not consider this issue in detail within the EA for the reasons discussed in Section 2.3. The standard WS Decision Model (Slate et al. 1992; see WS Directive 2.201) would be the site-specific procedure for individual actions that WS could conduct in the State (see Chapter 3 for a description of the Decision Model and its application). Decisions made using the model would be in accordance with WS' directives (see WS Directive 1.101) and SOPs described in the EA, as well as relevant laws and regulations in accordance with WS Directive 2.210.

The WS Decision Model (see WS Directive 2.201) described by Slate et al. (1992) depicts how WS' personnel would use a thought process for evaluating and responding to requests for assistance. WS' personnel would assess the problem and then evaluate the appropriateness and availability (legal and administrative) of strategies and methods based on biological, economic, humaneness, and social considerations. Following this evaluation, WS' employees would incorporate methods deemed practical for the situation into a damage management strategy. After WS' employees implemented this strategy, employees would continue to monitor and evaluate the strategy to assess effectiveness. If the strategy were effective, the need for further management would end. In terms of the WS Decision Model, most efforts to resolve wildlife damage consist of continuous feedback between receiving the request and monitoring the results of the damage management strategy. The Decision Model is not a written documented process, but a mental problem-solving process common to most, if not all, professions, including WS.

Comment 7 - The decision model that WS uses is old and must be expanded and updated.

Response: The WS Decision Model (see WS Directive 2.201) described by Slate et al. (1992) depicts how WS' personnel would use a thought process for evaluating and responding to damage complaints (see Chapter 3 of the EA for a description of the Decision Model and its application). Decisions made using the model would be in accordance with WS' directives and SOPs described in the EA as well as relevant laws and regulations. In section 3.1 of the EA, WS describes the alternatives in detail, including the methods, procedures, and recommendations that would be available for use to manage damage caused by predators under those alternatives.

WS only provides assistance after receiving a request for such assistance. If an assistance request were within the authority of WS, employees would gather and analyze damage information to determine applicable factors, such as what species was responsible for the damage, the type of damage, the extent of damage, and the magnitude of damage. Other factors that employees could gather and analyze would include the current economic loss or current threat (*e.g.*, threat to human safety), the potential for future losses or damage, the local history of damage, and what management methods, if any, were used to reduce past damage and the results of those actions. Once a problem assessment was completed, an employee would conduct an evaluation of available management methods. The employee would evaluate available methods in the context of their legal and administrative availability and their acceptability based

on biological, environmental, social, and cultural factors. An employee would formulate a management strategy using those methods that the employee determines to be practical for use. Employee would also consider factors essential to formulating each management strategy, such as available expertise, legal constraints on available methods, costs, and effectiveness.

After formulating a management strategy, the employee could provide technical assistance and/or direct operational assistance to the requester (see WS Directive 2.101). When providing direct operational assistance, it would be necessary to monitor the results of the management strategy. Monitoring would be important for determining whether further assistance was required or whether the management strategy resolved the request for assistance. Through monitoring, an employee would continually evaluate the management strategy to determine whether additional techniques or modification of the strategy was necessary. When providing technical assistance, a project would normally end after an employee provided recommendations or advice to the requester. A direct operational assistance project would normally end when personnel stop or reduce the damage or threat to an acceptable level to the requester or to the extent possible. Some damage situations may require continuing or intermittent assistance from personnel and may have no well-defined termination point. Therefore, the WS program applies a proven decision model and assessment process that ensures personnel employ the most appropriate and effective methods when resolving predator damage issues.

Comment 8 - WS should evaluate an alternative that includes:

1. Ending the use of inhumane management techniques

Response: The commenter claims the use of poisons, shooting from aircraft, traps, and snares are inhumane and the WS program should no longer use those methods. The WS program should substitute the numerous preventative and non-lethal methods available for those methods whenever possible.

The humaneness of methods and animal welfare concerns was an issue addressed in detail throughout the EA (see Section 2.2, Section 4.2, and Section 4.3 of the EA), including SOPs to address humaneness and animal welfare (see Section 3.3 and Section 3.4 of the EA). The NWRC functions as the research unit of the WS program by providing scientific information and the development of methods for wildlife damage management, which are effective and environmentally responsible. Research biologists with the NWRC work closely with wildlife managers, researchers, and others to develop and evaluate methods and techniques for managing wildlife damage. Therefore, the WS program has a dedicated unit for the research and development of new methods and incorporates those methods into activities when deemed practical and effective using the WS' Decision Model. It is the policy of WS to incorporate the Decision Model into agency decision-making when evaluating and responding to requests for assistance (see WS Directive 2.201). Once personnel complete a problem assessment after receiving a request for assistance, personnel would conduct an evaluation of available management methods. The employee would evaluate available methods in the context of their legal and administrative availability and their acceptability based on biological, environmental, social, and cultural factors. An employee would formulate a management strategy using those methods that the employee determines to be practical for use. Employees would also consider factors essential to formulating each management strategy, such as available expertise, legal constraints on available methods, costs, and effectiveness.

The EA states, “*WS would continue to seek new methods and ways to improve current technology to improve the humaneness of methods used to manage damage caused by wildlife. Cooperation with individuals and organizations involved in animal welfare continues to be an agency priority for the purpose of evaluating strategies and defining research aimed at developing humane methods.*” The WS program in North Dakota would continue to employ methods as humanely as possible to minimize pain and to address predators in a timely manner to minimize distress.

2. Adoption of an assessment tool for animal welfare

Response: The humaneness of methods and animal welfare concerns was an issue addressed in detail throughout the EA (see Section 2.2, Section 4.2, and Section 4.3 of the EA), including SOPs to address humaneness and animal welfare (see Section 3.3 and Section 3.4 of the EA). The EA states, “...research has not yet progressed to the development of objective, quantitative measurements of pain or stress for use in evaluating humaneness (Bateson 1991, Sharp and Saunders 2008, Sharp and Saunders 2011).” The citations provided by the commenter support this statement. When discussing the use of welfare assessments, Sharp and Saunders (2008, 2011) stated “[Kirkwood et al. (1994)] warn that the process of allocating a score to reflect the severity of harm to welfare should be used with great caution due to a number of difficulties with this approach.” Sharp and Saunders (2008, 2011) also stated “[w]ith regard to animal suffering, [Kirkwood et al. (1994)] take the view that that although all mammals and birds have the capacity to suffer the unpleasant sensations of pain or stress, there is insufficient information to grade this suffering. Although Sharp and Saunders (2008, 2011) attempt to address the use of a humaneness model, they also indicate such a model has several disadvantages. The disadvantages of welfare assessment identified by Sharp and Saunders (2008, 2011) include (1) subjective judgments would have to be made due to the lack of objective data relating to welfare, (2) a humaneness assessment would only provide a grade instead of providing an absolute measure, (3) grades assigned by individual assessors would be based purely on their own subjective opinion, and (4) a model cannot provide how the animal actually feels.

Many of the factors and considerations identified by Sharp and Saunders (2008, 2011) for use in humaneness models, have been addressed through the establishment of best management practices for trapping in the United States (e.g., see International Association of Fish and Wildlife Agencies 1997, Association of Fish and Wildlife Agencies 2006). WS recognizes the value and use of the best management practices for trapping and utilizes those guidelines as a basis for policy formulation (see WS Directive 2.450). As the EA states “[t]he goal of WS would be to use methods as humanely as possible to resolve requests for assistance to reduce damage and threats to human safety. WS would continue to evaluate methods and activities to minimize the pain and suffering of methods addressed when attempting to resolve requests for assistance.” Assessing animal welfare when managing animal damage is highly subjective, especially in environmental conditions that are difficult to predict and control. Therefore, WS relies on best management practices and environmental review processes that ensure applied techniques are as humane as possible without compromising efficiency and effectiveness.

3. Adoption of a conservation mandate

Response: The commenter claims that WS should make the health and integrity of ecological communities a priority by considering trophic cascades, mesopredator release, impacts on biodiversity, and conducting a benefit-cost analysis.

As stated previously, personnel complete a problem assessment after receiving a request for assistance and conduct an evaluation of available management methods. Personnel evaluate available methods in the context of their legal and administrative availability and their acceptability based on biological, environmental, social, and cultural factors. Therefore, personnel consider biological and environmental factors when evaluating available methods. During the scoping process for the EA, the WS program in North Dakota and the NDGFD identified a concern regarding the potential impact on biodiversity, ecosystem resilience, trophic cascades, and mesopredator release. The EA addresses those concerns in Section 4.2.

One issue identified by WS and the NDGFD during the development of the EA was the potential effects of activities on the populations of target predators and the potential effects of activities on the populations of non-target animals (see Section 2.2 in the EA). As stated throughout the EA, the WS program in North Dakota would only provide assistance under the appropriate alternatives after receiving a request to manage damage or threats. Therefore, if WS provided direct operational assistance under the alternatives, WS would provide assistance on a small percentage of the land area in the State. In addition, WS would only target those predators identified as causing damage or posing a threat of damage. WS would not attempt to suppress wildlife populations across broad geographical areas at such intensity levels for prolonged durations that significant ecological effects would occur. The goal of WS would not be to manage wildlife populations but to manage damage caused by specific individuals of a species. In North Dakota, the NDGFD is responsible for managing the populations of individual wildlife species. The role of WS would be to manage damage caused by individual animals within a population and not to manage the entire population of an individual species. Therefore, those factors would constrain the scope, duration, and intensity of actions under the alternatives.

Often of concern with the use of certain methods is that predators that WS lethally removes would only be replaced by other predators after WS completes activities (*e.g.*, predators that relocate into the area) or by predators the following year (*e.g.*, increase in reproduction and survivability that could result from less competition). The ability of an animal population to sustain a certain level of removal and to return to pre-management levels demonstrates that limited, localized damage management methods have minimal impacts on species' populations.

For example, studies suggest coyote territories would not remain vacant for very long after removing coyotes from an area. Gese (1998) noted that adjacent coyote packs adjusted territorial boundaries following social disruption in a neighboring pack, thus allowing for complete occupancy of the area despite removal of breeding coyotes. Blejwas et al. (2002) noted that a replacement pair of coyotes occupied a territory in approximately 43 days following the removal of the territorial pair. Williams et al. (2003) noted that temporal genetic variation in coyote populations experiencing high turnover (due to removals) indicated that “...*localized removal effort does not negatively impact effective population size...*”.

Section 4.2 of the EA analyzed the environmental consequences of each alternative in comparison to determine the extent of actual or potential impacts on those issues. Based on those quantitative and qualitative parameters addressed in the EA, the effects of lethal removal by WS for each predator species addressed in the EA would be of low magnitude when compared to population trend data, population estimates, and/or harvest data. The number of predators lethally removed annually under the alternatives would likely be similar since the removal of predators could occur despite no involvement by the WS program, or limited involvement by the WS program. The WS program does not have the authority to regulate the number of predators lethally removed annually by other entities.

Another issue identified by WS and the NDGFD during the development of the EA was the potential effects of activities on the populations of non-target animals (see Section 2.2 in the EA). While personnel would take precautions to safeguard against taking non-target animals during operational use of methods, the use of such methods could result in the incidental removal of unintended species. Based on the analyses in the EA, those occurrences should not affect the overall populations of any species. The WS program in North Dakota reviewed those threatened or endangered species listed in North Dakota during the development of the EA. WS has consulted and would continue to consult with the USFWS to evaluate activities to resolve predator damage to ensure the protection of threatened or endangered species and to comply with the ESA.

The Wildlife Society, the leading association of wildlife scientists, managers, and conservationists recognize in their Standing Position Statement on Wildlife Damage Management that “*Prevention or control of wildlife damage, which often includes removal of the animals responsible for the damage, is an essential and responsible part of wildlife management*” (The Wildlife Society 2015).

4. Requirement that WS’ staff fully document, through a formal process, to determine the need for control and ensure nonlethal control is a preferred practice, and fully accounts for all animals killed, including threatened and endangered species

Response: The commenter claims that WS should develop a documented formal process to determine the need for damage management to increase transparency, to guarantee that personnel are using non-lethal methods before lethal methods, and employees are following standard protocols. Commenter recommends that WS use an approach that provides justification, effectiveness, specificity, humaneness, evaluation, and follow-up.

As discussed in the EA, the WS Decision Model depicts how personnel would use a thought process for evaluating and responding to requests for assistance. Decisions made using the model would be in accordance with WS’ directives and SOPs described in the EA as well as relevant laws and regulations. The current Decision Model that WS’ personnel in North Dakota use encompasses the recommended approach of the commenter.

If an assistance request were within the authority of WS, employees would gather and analyze damage information to determine applicable factors, such as what species was responsible for the damage, the type of damage, the extent of damage, and the magnitude of damage. Other factors that employees could gather and analyze would include the current economic loss or current threat (*e.g.*, threat to human safety), the potential for future losses or damage, the local history of damage, and what management methods, if any, were used to reduce past damage and the results of those actions. This step within the Decision Model addresses the justification for the need to provide assistance. Once a problem assessment was completed, an employee would conduct an evaluation of available management methods. The employee would evaluate available methods in the context of their legal and administrative availability and their acceptability based on biological, environmental, social, and cultural factors. An employee would formulate a management strategy using those methods that the employee determines to be practical for use. Employees would also consider factors essential to formulating each management strategy, such as available expertise, legal constraints on available methods, costs, and effectiveness. This step within the Decision Model outlines the achievability, effectiveness, specificity, and humaneness considerations of the management strategy.

After formulating a management strategy, the employee could provide technical assistance and/or direct operational assistance to the requester (see WS Directive 2.101). When providing direct operational assistance, it would be necessary to monitor the results of the management strategy. Monitoring would be important for determining whether further assistance was required or whether the management strategy resolved the request for assistance. This step in the WS’ Decision model reflects the evaluation phase of the approach described by the commenter. Through monitoring, an employee would continually evaluate the management strategy to determine whether additional techniques or modification of the strategy was necessary. When providing technical assistance, a project would normally end after an employee provided recommendations or advice to the requester. A direct operational assistance project would normally end when personnel stop or reduce the damage or threat to an acceptable level to the requester or to the extent possible. Some damage situations may require continuing or intermittent assistance from personnel and may have no well-defined termination point. This step in the WS Decision Model would reflect the follow-up component of the process the commenter recommends. Therefore, WS applies a

proven decision model and assessment process that ensures personnel employ the most appropriate and effective methods when resolving predator damage issues.

WS' directives provide guidance to personnel when conducting official activities (see WS Directive 1.101), including a code of ethics (see WS Directive 1.301). Each employee is responsible for compliance with applicable work-related laws, regulations, and policies, including WS' directives. Pursuant to WS Directive 2.101, personnel would give preference to non-lethal methods when practical and effective; therefore, personnel would consider non-lethal methods before the use of lethal methods using the Decision Model.

5. Removal of all financial incentives to kill

Response: As discussed in the EA, funding for WS' activities could occur from federal appropriations, through state funding, and through cooperative funding. Cooperative service agreements with individual property owners or managers could also fund activities. The activities that WS' personnel provide would be the basis for funding, not whether employees use non-lethal or lethal methods. In North Dakota, federal and state appropriations are the primary source of funding for activities to manage damage and assistance is not fee-based. Federal, state, and local officials have made the decision to provide funding for damage management activities and have allocated funds for such activities.

Comment 9 – Killing animals is highly uncertain and controversial (*e.g.*, see Treves et al. 2016)

Response: Section 2.3 addresses the concerns about activities being highly uncertain and controversial. A response to the findings of Treves et al. (2016) occurs in Appendix E.

Comment 10 - The EA did not consider how providing free assistance de-incentivizes ranchers to take actions to prevent predation.

Response: As discussed in Section 1.2 and elsewhere in the EA, livestock producers in North Dakota do implement many non-lethal methods to prevent livestock predation. The primary non-lethal method employed by cattle producers in North Dakota was the use of guard animals. WS was instrumental in the introduction and adoption of livestock guarding dogs in the late 1980s and early 1990s and continues to recommend use of livestock guarding dogs where appropriate (Green and Woodruff 1983, Green and Woodruff 1988). The NWRC continues to conduct research into new breeds of livestock guarding dogs (Marlow 2016). Producers also reported using additional non-lethal methods, including culling, frequent checks, livestock carcass removal, exclusion fencing, fright tactics, herding, and night penning (NASS 2011). Sheep producers in the State use many of the same non-lethal methods, with guard animals being a primary method (APHIS Veterinary Services 2015).

Although WS' employees provide technical assistance to many livestock producers on non-lethal livestock protection strategies, some non-lethal methods available to alleviate damage or threats associated with predators are impractical for implementation by WS' personnel, such as altering livestock management practices (*e.g.*, night-penning, herding, carcass removal) and physical exclusion (*e.g.*, predator-proof fencing). Therefore, implementation of most non-lethal methods for livestock protection falls within the purview of the livestock producer (Knowlton et al. 1999). Those persons experiencing damage often employ non-lethal methods to reduce damage or threats prior to contacting the WS program. Many of those non-lethal methods (*e.g.*, fencing and guard animals) require a large investment in time to implement and have a high initial cost (Mitchell et al. 2004). Even with the additional effort and costs, those methods are not always effective at reducing damage and potentially have side effects (*e.g.*, concentrating livestock can cause unwanted damage to particular pasture areas) (Knowlton et al. 1999).

If WS implemented several of the alternative approaches discussed in Section 3.1, WS' personnel would use the WS Decision Model to evaluate and respond to requests for assistance, which would include assessing what management methods, if any, the requester was using to reduce damage and the results of those actions. Based on that assessment, WS could recommend or implement non-lethal methods to alleviate damage if WS implements several of the alternative approaches discussed in Section 3.1. In addition, pursuant to WS Directive 2.101, WS' personnel would give preference to non-lethal methods when they determine those methods to be practical and effective for the damage situation.

Comment 11 – WS should prepare an EIS

Response: The intent in developing this EA has been to determine if the alternative approaches developed to meet the need for action could potentially have significant individual and/or cumulative impacts on the quality of the human environment that would warrant the preparation of an EIS. If WS made a determination through this EA that the alternatives could have a significant impact on the quality of the human environment, then WS would publish a notice of intent to prepare an EIS and this EA would be the foundation for developing the EIS.

Comment 12 - WS failed to use the best available science as required by NEPA because:

1. Large-bodied carnivores are not resilient to human persecution

Response: The commenter appears to define “*large-bodied carnivores*” as mountain lions and wolves and claims that human persecution of those carnivores is “*super additive*”, which the commenter defines as “*...hunter kill or predator control rates on large carnivores has a multiplier effect on the ultimate increase in total mortality over what would occur in nature.*”

Section 4.2 of the EA addresses the potential effects of damage management activities on target predator populations, including mountain lions. The NDGFD is responsible for managing the mountain lion population in North Dakota. In Appendix D, the NDGFD stated, “*Over the past 10 years, WS has removed 1 mountain lion...at the request of [the NDGFD]. This particular mountain lion had been depredating domestic calves. The removal of 1 mountain lion over a 10-year period did not have a negative impact on the population sustainability and management of mountain lions in North Dakota.*” If the WS program in North Dakota implements Alternative 1, WS expects the need to lethal remove a mountain lion to occur infrequently similar to previous activities where WS removed one mountain lion over a 10-year period. WS does not expect the annual removal of mountain lions to occur at any level that would adversely affect the population in North Dakota. Removal would be limited to those individuals deemed causing damage or posing a threat and would likely only occur after the NDGFD requested WS remove the target mountain lion. Therefore, any removal of mountain lions by WS would occur within the management objectives of the NDGFD for the statewide mountain lion population.

As discussed in the EA, the USFWS considers the gray wolf to be an endangered species in North Dakota (see Section 4.2). Since FY 2005, the WS program in North Dakota has unintentionally removed three gray wolves during activities targeting coyotes. WS has consulted with the USFWS to evaluate activities to resolve predator damage and threats to ensure the protection of T&E species. Based on the biological assessment submitted by WS in December 2003, several coordination meetings between WS and the USFWS, and supporting literature, the USFWS issued a biological opinion on May 26, 2004 and concurred with WS' determinations. In the biological opinion, the USFWS established reasonable and prudent measure for WS in order to minimize the take of gray wolves (see Appendix C). The USFWS also determined that WS could incidentally remove up to four gray wolves per year in the State during activities to manage damage associated with predators. The USFWS further determined that the

incidental lethal removal of up to four wolves per year in the State by WS would not jeopardize the gray wolf as long as WS initiated the reasonable and prudent measures (see Appendix C).

During the development of the EA, WS reviewed the current list of species designated as threatened or endangered in North Dakota as determined by the USFWS and re-initiated consultation with the USFWS in August 2016. The USFWS re-affirmed its earlier findings that WS could incidentally take up to four gray wolves per year and that level of take would not jeopardize the existence of gray wolves. WS' personnel would continue to abide by all reasonable and prudent measures, including the terms and conditions that implement the reasonable and prudent measures, as outlined in the biological opinion issued by the USFWS to avoid jeopardizing the status of the gray wolf (see Appendix C).

2. Hounding is cruel, harmful and disruptive

Response: WS' personnel in North Dakota rarely use tracking dogs in the way the commenter describes because of their limited application to a few wildlife species, such as mountain lions, bobcats, and raccoons. As discussed in Section 4.2, mountain lions and bobcats are species that WS addresses infrequently and/or in limited numbers. In addition, the WS program in North Dakota has not previously used tracking dogs to locate mountain lions, bobcats, or raccoons. The use of tracking dogs by WS would occur infrequently and in limited situations to target specific animals. As discussed in Appendix B, WS Directive 2.445 establishes standards and responsibilities for WS' use of trained dogs to assist in accomplishing activities. When using trained dogs, WS' personnel would adhere to WS Directive 2.445.

3. Trapping is cruel and indiscriminate

Response: The humaneness of methods and animal welfare concerns was an issue addressed in detail throughout the EA (see Section 2.2, Section 4.1, and Section 4.2 of the EA), including standard operating procedures to address humaneness and animal welfare (see Section 3.3 and Section 3.4 of the EA). See response to Comment 8. Appendix B also discusses WS' use of trap monitors.

Comment 13 - Biological study demonstrates that killing coyotes does not reduce their populations; coyotes should not be randomly persecuted with predator control

Response: When WS receives a request for assistance, the objective is to manage the damage a coyote is causing, not to manage coyote populations. WS does not attempt to manage the coyote population. The goal would be to reduce damage, risks, and conflicts with individual coyotes as requested and not to reduce the coyote population. WS does this by following the WS Decision Model and by following all applicable laws, regulations, and WS' directives. If the WS program in North Dakota implements Alternative 1, when an appropriate landowner/manager requests such assistance and when WS' personnel deem the use of those methods appropriate, WS' personnel could target individual coyotes causing damage or posing a threat to cause damage. WS' personnel would not randomly persecute coyotes. Removing coyotes to alleviate damage could be short-term with new coyotes immigrating into the area or born to animals remaining at the site. The ability of coyotes to sustain a certain level of removal and to return to pre-management levels does not mean individual management actions were unsuccessful, but that periodic management may be necessary. The return of coyotes to pre-management levels also demonstrates that limited, localized damage management methods have minimal impacts on the coyote population.

WS often receives comments that lethal methods are ineffective because additional predators would likely return to the area. In addition, commenters also claim that because predators return to an area after initial removal efforts were complete, the use of lethal methods gives the impression of creating a financial incentive to continue the use of only lethal methods. Those statements assume predators only return to an

area where damage was occurring if WS or other entities used lethal methods. However, the use of non-lethal methods would also often be temporary, which could result in predators returning to an area where damage was occurring once WS or other entities no longer used those methods.

Comment 14 - Gray wolves are ecologically important, not resilient to persecution, and are federally protected; gray wolves should be restored in North Dakota

Response: The EA clearly indicates the USFWS considers those wolves in North Dakota to be endangered species. Section 4.2 discusses the consultation history between WS and the USFWS. During the development of the EA, WS reviewed the current list of species designated as threatened or endangered in North Dakota as determined by the USFWS and re-initiated consultation with the USFWS in August 2016. The USFWS re-affirmed its earlier findings that WS could incidentally take up to four gray wolves per year and that level of take would not jeopardize the existence of gray wolves. WS' personnel would continue to abide by all reasonable and prudent measures, including the terms and conditions that implement the reasonable and prudent measures, as outlined in the biological opinion issued by the USFWS to avoid jeopardizing the status of the gray wolf (see Appendix C). The incidental take of wolves by the WS program in North Dakota has been far below the incidental take allowed by the USFWS. In addition, there is no hunting and/or trapping season for wolves in North Dakota and the WS program has not conducted activities to alleviate predation associated with wolves in North Dakota. Therefore, the “*persecution*” of wolves, as described by the commenter, does not occur in North Dakota. The restoration of wolves in North Dakota is outside the scope of this EA.

Comment 15 - The EA failed to discuss that bobcats are widely persecuted for their fur and require protections from WS' indiscriminate, cruel traps and snares

Response: On average, the WS program lethally removed one bobcat per year between FY 2009 and FY 2014 with the highest annual removal being four bobcats (see Table 4.1 in Section 4.2). As discussed in Section 4.2, the WS program in North Dakota anticipates requests for assistance associated with bobcats to occur infrequently and involve only a few individuals. The NDGFD is responsible for managing the bobcat population in North Dakota. In regards to bobcats, the NDGFD stated, “*The amount of removal conducted by WS...is minuscule and of no concern to their population sustainability or management*” (see Appendix D). Managing the statewide population of bobcats is the responsibility of the NDGFD.

Comment 16 - The EA failed to analyze the importance of North Dakota's mountain lion population relative to connecting western mountain lion and eastern cougar populations

Response: See responses to Comment 12. The NDGFD is responsible for managing the mountain lion population in the State. Therefore, the decision to implement or not implement a harvest season is outside the scope of the EA. Similarly, the decision on how the NDGFD decides to implement a harvest season is also outside the scope of the EA. In addition, the eastern cougar (*P. c. cougar*) is likely extinct (McCullough 2011) and the USFWS is currently considering the removal of the eastern cougar from the list of threatened or endangered wildlife because the eastern cougar is likely extinct (81 FR 34595-34605, 81 FR 41925-41926).

In addition, the commenter incorrectly states in their comments that WS has killed 18 mountain lions in North Dakota between 2009 and 2014. As shown in Table 4.1, between FY 2009 and FY 2014, the WS program in North Dakota lethally removed one mountain lion in the State. The NDGFD requested WS remove the mountain lion to prevent further livestock depredation. As discussed in Section 4.1, WS anticipates the lethal removal of mountain lions in the State to occur infrequently and continue to be similar in frequency to activities that occurred from FY 2009 through FY 2014. In Appendix D, the NDGFD stated, “*Over the past 10 years, WS has removed 1 mountain lion...at the request of [the*

NDGFD]. *This particular mountain lion had been depredating domestic calves. The removal of 1 mountain lion over a 10-year period did not have a negative impact on the population sustainability and management of mountain lions in North Dakota.*” If the WS program in North Dakota implements Alternative 1, WS expects the need to lethal remove a mountain lion to occur infrequently similar to previous activities where WS removed one mountain lion over a 10-year period. WS does not expect the annual removal of mountain lions by WS to occur at any level that would adversely affect the population in North Dakota. Removal by WS would be limited to those individuals deemed causing damage or posing a threat and would likely only occur after the NDGFD requested WS remove the target mountain lion. Therefore, any removal of mountain lions by WS would occur within the management objectives of the NDGFD for the statewide mountain lion population.

Comment 17 - WS failed to fully disclose all of the non-lethal techniques available to the livestock industry to protect cattle and sheep

Response: Appendix B discusses those methods that the WS program in North Dakota could employ and/or recommend for use when receiving a request for assistance. The commenter discusses many non-lethal methods and claims those methods were not discussed in the EA. However, the EA and Appendix B discuss those methods identified by the commenter, including cultural methods, guard animals, exclusion, habitat management, animal husbandry techniques, and animal behavior modification methods. WS does recommend various non-lethal methods to livestock producers that have varying degrees of effectiveness depending on the time of year, location, weather, and the type of operation of the livestock producer. The NWRC is continually researching many non-lethal livestock protection techniques. Some non-lethal methods available to alleviate damage or threats associated with predators are impractical for implementation by WS’ personnel, such as altering livestock management practices (*e.g.*, night-penning, herding, carcass removal) and physical exclusion (*e.g.*, predator-proof fencing). Therefore, implementation of most non-lethal methods for livestock protection falls within the purview of the livestock producer (Knowlton et al. 1999).

Producers in North Dakota use night penning, guard dogs, llamas, fencing, other non-lethal methods, donkeys, frequent checks, lamb shed, culling, frightening tactics, bedding change, carrion removal, and herding to reduce predation. In 2014, the APHIS Veterinary Services (2015) reported that North Dakota sheep producers used guard dogs, llamas, donkeys, fencing, lamb shed, herding, night penning, fright tactics, removing carrion, culling, change bedding, frequent checks, altered breeding season, and other non-lethal methods. The NASS (2011) also reported that North Dakota cattle producers used guard animals, culling, frequent checks, carcass removal, exclusion fencing, fright tactics, herding, night penning, and other non-lethal methods to reduce predation.

Comment 18 - Killing mammalian carnivores will not grow ungulate populations

Response: Under some circumstances, managing predation can be an important tool in maintaining specific wildlife management objectives. Managing game species in North Dakota is the responsibility of the NDGFD and any decision to manage predation to benefit local game populations would be the responsibility of the NDGFD. However, WS could provide assistance if requested by the NDGFD. A major goal of WS would be to provide protection and conduct actions in areas where data suggests that managing predators would likely be effective and successful (Ballard et al. 2001).

WS could receive requests to assist with preventing predation on other wildlife species. If a management agency finds that predation could adversely affect a particular species, WS could assist in determining if damage management efforts could help protect the species and implement necessary, if any, actions to prevent predation. In many cases, requests for assistance to manage damage to natural resources involve threatened or endangered species.

Comment 19 - WS must uphold the Endangered Species Act because WS has a duty to conserve, duty to consult, and a duty to protect

Response: Section 1.5 discusses the statutory authority of the WS program. As discussed in Section 1.2 and shown in Table 1.1, WS has and would continue to provide assistance when appropriate agencies determine a need for WS' assistance to protect natural resources, including threatened or endangered species. For example, WS has provided assistance to manage predation risks to threatened piping plovers and endangered least terns in North Dakota.

As discussed in Section 4.2 of the EA, WS has consulted and would continue to consult with the USFWS. During the development of the EA, WS reviewed the current list of species designated as threatened or endangered in North Dakota as determined by the USFWS and re-initiated consultation with the USFWS in August 2016. The USFWS concurred with WS' effects determinations and affirmed its earlier findings that WS could incidentally take up to four gray wolves per year and that level of take would not jeopardize the existence of gray wolves. WS' personnel would continue to abide by all reasonable and prudent measures, including the terms and conditions that implement the reasonable and prudent measures, as outlined in the biological opinion issued by the USFWS to avoid jeopardizing the status of the gray wolf (see Appendix C).

Comment 20 – Predator damage management should not occur at taxpayer expense

Response: During the development of the EA, the use of money from taxpayers to conduct activities was an issue that WS and the NDGFD identified but the EA did not address the issue in detail for the reasons provided in Section 2.3.

Comment 21 – Funding for the WS program should be cut to zero. The WS program should be shut down

Response: Damage management activities are an appropriate sphere of activity for government programs, since managing wildlife is a government responsibility. Eliminating the WS program would be similar to the alternative analyzed in detail in the EA where there would be no involvement by the WS program with any aspect of managing predator damage in North Dakota (see Alternative 4). Therefore, adding an analysis of an additional alternative whereby WS or another entity pursued the termination of the funding for WS would not add to the existing analyses in the EA. Under Alternative 4, the WS program would not provide assistance with any aspect of managing predator damage; however, other entities could conduct damage management activities in the absence of the WS program.

Comment 22 – WS sneaks into areas with no notice to anyone

Response: The WS program only provides assistance after receiving a request for such assistance and only after the entity requesting assistance and WS sign a Memorandum of Understanding, work initiation document, or another similar document. Therefore, the decision-maker for what activities WS conducts is the entity that owns or manages the affected property. The decision-makers have the discretion to involve others as to what occurs or does not occur on property they own or manage. Therefore, in the case of an individual property owner or manager, the involvement of others and to what degree others were involved in the decision-making process would be a decision made by that individual. Section 3.1 in the EA discusses the decision-making process associated with communities, private property owners, and public property managers.

In addition, the NDGFD has regulatory authority to manage populations of wildlife in the State (see Section 1.5 in the EA). Therefore, the lethal removal of predators by WS to alleviate damage would only occur when authorized by the NDGFD, when required, and only at levels authorized. The NDGFD could consider all known removal when determining population objectives for wildlife and could adjust the species and the number of individuals of a species that people can harvest during the regulated hunting/trapping season and the number of wildlife that people can remove for damage management purposes to achieve the population objectives. Any removal of regulated wildlife species by WS would occur at the discretion of the NDGFD. Therefore, any wildlife population declines or increases would be the collective objective for those wildlife populations established by the NDGFD through the regulation of lethal removal. The cumulative removal of individuals from a wildlife species annually or over time by WS would occur at the discretion of the NDGFD as part of management objectives for wildlife in the State.

WS made the EA available to the public for review and comment by a legal notice published in the *Bismarck Tribune* and *The Forum* newspaper. WS also made the EA available to the public for review and comment on the APHIS website and on the regulations.gov website. In addition, WS sent a notice of availability directly to agencies, organizations, and individuals with probable interest in managing mammal damage in the State. WS encourages people to sign-up for notifications through the APHIS Stakeholder Registry. People can access the registry by going to the APHIS website and clicking on the APHIS Stakeholder Registry link on the home page. People can access the APHIS home page and the registry by visiting the website at <https://www.aphis.usda.gov/aphis/home/>.

Comment 23 – Commenter opposes any involvement by WS

Response: WS developed alternatives to meet the need for action, which the EA describes in Chapter 1, and to address the identified issues associated with managing damage caused by predators, which the EA describes in Chapter 2. The EA analyzed a no involvement by the WS program alternative (Alternative 4; see Section 3.1 of the EA). Under Alternative 4, the WS program would not provide assistance with any aspect of managing predator damage in the State. Section 4.2 of the EA analyzes the environmental consequences of each of the alternatives in comparison to determine the extent of actual or potential impacts on the issues, including the no involvement by WS alternative. Based on the analyses of the alternatives that were developed to address those issues analyzed in detail within the EA, including individual and cumulative impacts of those alternatives, the WS program will issue a decision for the final EA.

Comment 24 – The EA should consider the ecosystem services that top carnivores provide; the EA should consider trophic cascades; the EA should consider mesopredator release

Response: The EA addresses ecosystem services, trophic cascades, and mesopredator release under Issue 2 in Section 4.2 of the EA.

Comment 25 – People should learn to co-exist and share common landscapes with predators because reducing predators fails to protect livestock or ungulates

Response: The objective of the WS program in North Dakota is not to reduce the predator population in the State. As stated throughout the EA, the objective of the WS program would be to reduce damage associated with those predators causing damage or posing a threat of damage. As discussed in Section 3.1, education would be an important element when the WS program in North Dakota provides technical assistance because wildlife damage management is about finding balance and coexistence between the needs of people and the needs of wildlife. The effectiveness of methods to manage damage or threats of damage associated with predators was an issue the WS and the NDGFD identified during the

development of the EA but was an issue not considered in detail for the reasons provided in Section 2.3 of the EA.

Comment 26 – Persecuting wolves and mountain lions increases livestock depredation

Response: The commenter states that persecuting wolves and mountain lions increases livestock depredation. However, wolves are an endangered species in North Dakota and there is no hunting or trapping season for wolves in the State. In addition, the removal of wolves by WS to prevent livestock depredation has not occurred previously in North Dakota. The NDGFD allows people to harvest mountain lions in the State during an annual season. The implementation of a harvest season for mountain lions by the NDGFD is outside the scope of this EA.

As shown in Table 4.1, between FY 2009 and FY 2014, the WS program in North Dakota lethally removed one mountain lion in the State. The NDGFD requested WS remove the mountain lion to prevent further livestock depredation. As discussed in Section 4.1, WS anticipates the lethal removal of mountain lions in the State to occur infrequently and continue to be similar in frequency to activities that occurred from FY 2009 through FY 2014. The WS program in North Dakota has not documented or identified an increase in livestock depredation by mountain lions associated with the implementation of the harvest season for mountain lions by the NDGFD nor is an increase in livestock predation likely to occur from the infrequent removal of mountain lions by the WS program in North Dakota.

Comment 27 – The EA does not discuss species extinction rates and that megafauna are in dramatic decline around the world because of human persecution

Response: Two issues that the WS program in North Dakota and the NDGFD identified during the development of the EA were the potential impacts of the alternatives on the populations of target species and non-target species, including threatened or endangered species (see Issue 1 and Issue 2 in Section 2.2, Section 4.2, and Section 4.3 in the EA). Most of the target predator species identified in the EA have annual hunting and/or trapping seasons in the State and people can harvest most species without any limit on the number that people can harvest during the hunting and/or trapping seasons, which provides an indication that those species are not of low density in the State. None of the target species identified in the EA are near extinction or even face extirpation from the State. Based on a review of WS' activities, the NDGFD concluded the activities of the WS program in North Dakota are not having adverse effects on the populations of target predator species in the State (see Appendix D).

In addition, the WS program in North Dakota and the NDGFD identified the issue of potential effects of the alternatives on the populations of non-target species, including threatened or endangered species. As discussed in Section 4.2 and Section 4.3, the unintentional removal of animals by the WS program in North Dakota would likely be limited and would not reach a magnitude where adverse effects would occur. In addition, people can harvest some of the species lethally removed by WS as unintentional non-target animals during annual hunting and/or trapping seasons. Based on the methods available to resolve predator damage and/or threats, WS does not anticipate the number of non-target animals lethally removed to reach a magnitude where declines in those species' populations would occur. Therefore, removal of non-target animals would not cumulatively affect the populations of non-target species.

During the development of the EA, WS reviewed the current list of species designated as threatened or endangered in North Dakota as determined by the USFWS and re-initiated consultation with the USFWS in August 2016. The USFWS concurred with WS' effects determinations in a letter of concurrence dated November 18, 2016 and affirmed its earlier findings that WS could incidentally take up to four gray wolves per year and that level of take would not jeopardize the existence of gray wolves (see Section 4.2). WS' personnel would continue to abide by all reasonable and prudent measures, including the terms and

conditions that implement the reasonable and prudent measures, as outlined in the biological opinion issued by the USFWS to avoid jeopardizing the status of the gray wolf (see Appendix C).

Therefore, the EA did not discuss the species extinction rate worldwide because those species addressed in the EA are not near extinction nor are factors likely to result in the extirpation of those species from the State. In addition, through the monitoring of WS' activities, the WS program in North Dakota and the NDGFD can evaluate and adjust activities as changes occur over time.

Comment 28 – The killing of wolves by WS in North Dakota is illegal and WS should consult with the USFWS

Response: As discussed in Section 4.2 of the EA, WS has consulted and would continue to consult with the USFWS. During the development of the EA, WS reviewed the current list of species designated as threatened or endangered in North Dakota as determined by the USFWS and re-initiated consultation with the USFWS in August 2016. In a letter of concurrence dated November 18, 2016, the USFWS concurred with WS' effects determinations and affirmed its earlier findings that WS could incidentally take up to four gray wolves per year and that level of take would not jeopardize the existence of gray wolves. WS' personnel would continue to abide by all reasonable and prudent measures, including the terms and conditions that implement the reasonable and prudent measures, as outlined in the biological opinion issued by the USFWS to avoid jeopardizing the status of the gray wolf (see Appendix C).

Comment 29 – WS should map wildlife damage to predict and prevent future attacks

Response: As presented in Section 1.3, many of the predator species addressed in this EA occur statewide and throughout the year in the State; therefore, damage or threats of damage could occur wherever those predators occur. Planning for the management of predator damage must be viewed as being conceptually similar to the actions of other entities whose missions are to stop or prevent adverse consequences from anticipated future events for which the actual sites and locations where they would occur are unknown but could be anywhere in a defined geographic area. Examples of such agencies and programs include fire departments, police departments, emergency clean-up organizations, and insurance companies. Although WS could predict some locations where predator damage would occur, WS could not predict every specific location or the specific time where such damage would occur in any given year. In addition, the threshold triggering an entity to request assistance from WS to manage damage associated with predators is often unique to the individual; therefore, predicting where and when WS would receive such a request for assistance would be difficult. This EA emphasizes major issues as those issues relate to specific areas whenever possible; however, many issues apply wherever predator damage and the resulting management actions occur and this EA treats those issues as such.

Chapter 2 of this EA identifies and discusses issues relating to predator damage management in North Dakota. The standard WS Decision Model (Slate et al. 1992; see WS Directive 2.201) would be the site-specific procedure for individual actions that WS could conduct in the State (see Chapter 3 for a description of the Decision Model and its application). Decisions made using the model would be in accordance with WS' directives (see WS Directive 1.101) and SOPs described in this EA, as well as relevant laws and regulations in accordance with WS Directive 2.210.

CHAPTER 6: LIST OF PREPARERS AND PERSONS CONSULTED

6.1 LIST OF PREPARERS

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APPENDIX A LITERATURE CITED

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APPENDIX B

METHODS AVAILABLE FOR RESOLVING OR PREVENTING PREDATOR DAMAGE

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

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

A variety of methods would potentially be available to the WS program in North Dakota relative to the management or reduction of damage from predators. Various federal, state, and local statutes and regulations and WS directives would govern WS' use of damage management methods. WS would develop and recommend or implement strategies based on resource management, physical exclusion, and wildlife management approaches. Within each approach there may be available a number of specific methods or techniques. The following methods could be recommended or used by the WS program in North Dakota. Many of the methods described would also be available to other entities in the absence of any involvement by the WS program. When North Dakota WS receive a request for assistance, personnel consider the range of limitations as they apply the WS decision-making process described in Slate et al. (1992) and WS Directive 2.201 to determine what method(s) to use to resolve a wildlife damage problem.

Non-chemical Wildlife Damage Management Methods

Non-chemical management methods consist primarily of tools or devices used to repel, capture, or kill a particular animal or local population of wildlife to alleviate damage and conflicts. Methods may be non-lethal (*e.g.*, fencing, frightening devices) or lethal (*e.g.*, firearms, body grip traps). If WS' personnel apply those methods, a MOU, work initiation document, or another similar document must be signed by the landowner or administrator authorizing the use of each damage management method. Non-chemical methods used or recommended by WS could include:

Exclusion pertains to preventing access to resources through fencing or other barriers. Fencing can sometimes prevent animals that cannot climb from entering areas of protected resources. Fencing installed with an underground skirt can prevent access to areas for many mammal species that dig, including coyotes, fox, raccoons, and striped skunks. Areas such as airports, yards, or gardens may be fenced, using either electric or non-electric fencing. Hardware cloth or other metal barriers can sometimes be used to prevent the entry of smaller predators, like skunks and raccoons, into buildings through existing holes or gaps.

Fences are widely used to prevent damage from predators. Exclusionary fences constructed of woven wire or multiple strands of electrified wire can be effective in keeping predators from some areas such as a sheep pasture or an airport. For example, Matchett et al. (2013) found that electronet could exclude

coyotes from black-tailed prairie dog (*Cynomys ludovicianus*) colonies. The size of the wire grid and height of the fence must be able to keep the predators out. In addition, an underground apron (*e.g.*, fencing in the shape of an “L” going outward) about 2 feet down and 2 feet out helps make a fence more wildlife proof; the “L” keeps predators out that dig crawl holes under the fence. However, fencing has limitations. Even an electrified fence is not always wildlife-proof and the expense of the fencing can often exceed the benefit. In addition, if large areas are fenced, the wildlife being excluded has to be removed from the enclosed area to make it useful. Some fences inadvertently trap, catch or affect the movement of non-target wildlife and may not be practical or legal in some areas (*e.g.*, restricting access to public land) (*e.g.*, see Huijser et al. 2008).

Cultural Methods includes the application of practices that seek to minimize exposure of the protected resource to damaging animals through processes other than exclusion. They may include animal husbandry practices such as employing guard dogs, herders, shed lambing, carcass removal, or pasture selection. Strategies may also include minimizing cover where damaging predators might hide, manipulating the surrounding environment through barriers or fences to deter animals from entering a protected area.

For example, WS may talk with residents of an area to eliminate the feeding of wildlife that occurs in parks, recreational sites, or residential areas to reduce damage by certain predators, such as coyotes. Some coyotes that cause damage in urban environments are attracted to homes by the presence of garbage or pet food left outside and unprotected. Removal or sealing of garbage in tight trash receptacles, and elimination of all pet foods from outside areas can reduce the presence of unwanted animals. However, many people who are not directly affected by problems caused by wildlife enjoy wild animals and engage in activities that encourage their presence.

Another example of human behavior modification consists of assisting people that have a fear of an animal. WS receives calls about species, such as coyotes, that are not causing damage. Their mere presence is perceived as a threat to the callers even though the animal is in its natural habitat. Personnel of WS provide educational information and reassurance about these species.

Guard Animals are used in damage management to protect a variety of resources, primarily livestock, and can provide adequate protection at times (Andelt 2004, Gehring et al. 2010a, VerCauteren et al. 2012). Gehring et al. (2010b) provides a historical overview of the use of guard animals to protect livestock from predation. Guard animals (*e.g.*, dogs, burros, and llamas) have proven successful in many sheep and goat operations. The effectiveness of guarding animals may not be sufficient in areas where there is a high density of wildlife to be deterred, where the resource (*e.g.*, sheep foraging on open range) is widely scattered, or where the guard animal to resource ratios are less than recommended. WS Directive 2.440 provides guidelines for the activities of WS’ personnel relating to the use of livestock guarding dogs for protecting livestock from predation. All WS’ field personnel will be knowledgeable in the use and application of livestock guarding dogs and will assist producers who may be interested in using livestock guarding dogs by providing information and/or referring them to other WS’ personnel for further assistance. WS was instrumental in the introduction and adoption of livestock guarding dogs in the late 1980s and early 1990s and continues to recommend use of livestock guarding dogs where appropriate (Green and Woodruff 1983, Green and Woodruff 1988). The NWRC continues to conduct research into new breeds of livestock guarding dogs (Marlow 2016).

Habitat Management would involve localized manipulation of habitats to minimize the presence of predators. Localized habitat management is often an integral part of damage management. The type, quality, and quantity of habitat are directly related to the wildlife produced or attracted to an area. Habitat can be managed to not produce or attract certain wildlife species. Habitat management is typically aimed at eliminating cover used by particular predators at specific sites. Limitations of habitat management as a

method of reducing predator damage are determined by the characteristics of the species involved, the nature of the damage, economic feasibility, and other factors. Legal constraints may also exist that preclude altering particular habitats.

Animal Husbandry Techniques includes modifications in the level of care and attention given to livestock, shifts in the timing of breeding and births, indoor birthing areas, selection of less vulnerable livestock species to be produced, shifting grazing locations, and the introduction of human custodians (herders) to protect livestock. The level of care or attention given to livestock may range from daily to seasonal. Generally, as the frequency and intensity of livestock handling increase, so does the degree of protection (Robel et al. 1981). In operations where livestock are left unattended for extended periods, the risk of depredation is greatest. The risk of depredation can be reduced when operations permit nightly gathering so livestock are unavailable during the hours when predators are most active. It is also possible to reduce predation of sheep by concentrating sheep in smaller areas (Sacks and Neale 2002). Additionally, the risk of depredation is usually greatest with immature livestock. This risk diminishes as age and size increase and can be minimized by holding expectant females in pens or sheds to protect births and by holding newborn livestock in pens for the first two weeks. Shifts in breeding schedules can also reduce the risk of depredation by altering the timing of births to coincide with the greatest availability of natural prey to predators or to avoid seasonal concentrations of predators. The use of herders can also provide some protection from predators, especially those herders accompanying bands of sheep on open range where they are highly susceptible to predation.

Animal behavior modification refers to tactics that deter or repel damaging predators and thus, reduce damage to the protected resource. Those techniques are usually aimed at causing target animals to respond by fleeing from the site or remaining at a distance. They usually employ extreme noise or visual stimuli. Unfortunately, many of these techniques are only effective for a short time before wildlife habituate to them (Conover 1982, Mitchell et al. 2004). Devices used to modify behavior in predators include fladry (Mettler and Shivik 2007, Young et al. 2015), electronic guards (siren strobe-light devices) (Linhart et al. 1992), propane exploders, pyrotechnics, laser lights, human effigies, and the noise associated with the discharge of a firearm.

The success of frightening methods depends on an animal's fear of, and subsequent aversion to, offensive stimuli (Shivik and Martin 2001, Shivik et al. 2003, Mettler and Shivik 2007). A persistent effort is usually required to effectively apply frightening techniques and the techniques must be sufficiently varied to prolong their effectiveness. Over time, animals often habituate to commonly used scare tactics and ignore them (*e.g.*, see Dolbeer et al. 1986, Bomford 1990, Shivik et al. 2003, Mitchell et al. 2004, Shivik 2006). In addition, in many cases, animals frightened from one location become a problem at another. Scaring devices, for the most part, are directed at specific target species and operated by private individuals or personnel of WS working in the field. However, several of these devices, such as scarecrows and propane exploders, are automated.

Harassment and other methods to frighten animals are probably the oldest methods of combating wildlife damage. These devices may be either auditory or visual and provide short-term relief from damage. A number of sophisticated techniques have been developed to scare or harass wildlife from an area. The use of noise-making devices (*e.g.*, electronic distress sounds, propane cannons, and pyrotechnics) is the most popular. Other methods include harassment with visual stimuli (*e.g.*, flashing or bright lights, scarecrows, human effigies), vehicles, or people. Some methods such as the electronic guard use a combination of stimuli (siren and strobe light). These are used to frighten predators from the immediate vicinity of the damage prone area. As with other damage management efforts, these techniques tend to be more effective when used collectively in a varied regime rather than individually. However, the continued success of these methods frequently requires reinforcement by limited shooting or other local population reduction methods.

Live Capture and Translocation can be accomplished using hand capture, catch poles, cage traps, some cable devices, or with foothold traps to capture predators for the purpose of translocating them for release in other areas. WS could employ those methods in North Dakota when the target animal(s) can legally be translocated or can be captured and handled with relative safety by WS' personnel. Live capture and handling of predators poses an additional level of human health and safety threat if predators are aggressive or extremely sensitive to the close proximity of people. For that reason, WS may limit this method to specific situations. In addition, moving damage-causing individuals to other locations can typically result in damage at the new location, or the translocated individuals can move from the relocation site to areas where they are unwanted. Although translocation is not necessarily precluded in all cases, it would be logistically impractical, in most cases, and biologically unwise in North Dakota due to the risk of disease transmission. High population densities of some animals may make this a poor wildlife management strategy for those species. Translocation would be evaluated by WS on a case-by-case basis. Translocation would only occur with the prior authorization of the NDGFD.

Trapping can utilize a number of devices, including foothold traps, cage-type traps, and body-gripping traps, foot snares, and neck/body snares. Trapping methods would be available to all entities under the alternatives.

Foothold Traps can be effectively used to capture a variety of animals. Foothold traps can be placed beside, or in some situations, in travel ways being actively used by the target species. Placement of traps is contingent upon the habits of the respective target species, habitat conditions, and presence of non-target animals. Effective trap placement and adjustment and the use and placement of appropriate baits and lures by trained WS' personnel also contribute to the selectivity of foothold traps. An additional advantage is that foothold traps can allow for the on-site release of non-target animals since animals are captured alive. The use of foothold traps requires more skill than some methods. Foothold traps would generally be available for use by the public and other state or federal agencies.

Cable devices are typically made of single or multi-strand cable, and can be set to capture an animal by the neck, body, and foot. They can be used effectively to catch most species, but are most frequently used to capture coyotes, fox, and mountain lions. Cable devices are much lighter and easier to use than other methods and are not generally affected by inclement weather. Cable devices may be used as either lethal or live-capture devices depending on how or where they are set. Cable devices set to capture an animal by the neck are usually lethal but stops can be attached to the cable to increase the probability of a live capture depending on the trap check interval. Cable devices positioned to capture the animal around the body can be a useful live-capture device, but are more often used as a lethal control technique. Cable devices can incorporate a breakaway feature to release non-target wildlife and livestock where the target animal is smaller than potential non-target animals (Phillips et al. 1990, Phillips 1996, Proulx et al. 2015). Cable devices can be effectively used wherever a target animal moves through a restricted travel lane (*e.g.*, under fences or trails through vegetation). When an animal moves forward into the loop formed by the cable, the noose tightens and the animal is held. Cable devices must be set in locations where the likelihood of capturing non-target animals is minimized.

The NDGFD requires neck snares to have a breakaway feature that will disassemble at no more than 350 pounds of pull. The regulation allows for the release of non-target wildlife, such as deer and livestock. The cable diameter of neck snares must be 1/16 of an inch or larger, and when set, the bottom loop cannot be more than 12 inches above the ground. All neck snares set in North Dakota must be attached to an immobile object.

The foot or leg snare can be set as a spring-powered non-lethal device, activated when an animal places its foot on the trigger or pan. In some situations, using snares to capture wildlife is impractical due to the behavior or morphology of the animal, or the location of many wildlife conflicts. Foot snares are used effectively to capture large predators, such as mountain lions. Additionally, several foot snare designs have been developed to capture smaller predators such as coyotes and bobcats. In general, cable devices would be available to all entities to alleviate damage.

Body-grip Traps are designed to cause the quick death of the animal that activates the trap. Body-grip traps are not often used during predator damage management, except for smaller predators (*e.g.*, raccoons, skunks, and mink). Body-grip traps have a pair of square, rotating jaws that when activated typically strike an animal at neck and throat areas. WS policy prohibits the use of body-grip traps with a jaw spread exceeding 8 inches for land sets. NDGFD regulations also govern the use of body-grip traps; those regulations are available from the NDGFD.

Cage traps come in a variety of styles to live-capture animals. The most commonly known cage traps are box traps. Box traps are usually rectangular and are made from various materials, including metal, wire mesh, or plastic. These traps are used to capture animals alive and can often be used where many lethal tools were impractical. These traps are well suited for use in residential areas and work best when baited with foods attractive to the target animal. Box traps are generally portable and easy to set-up.

Cage traps have some disadvantages. Some individual target animals may avoid cage traps (*i.e.*, become trap shy). Some non-target animals may associate the traps with available food and they purposely enter the traps to eat the bait, making the trap unavailable to catch target animals. Cage traps must be checked frequently to ensure that captured animals are not subjected to extreme environmental conditions. Some animals will fight to escape, which may cause injuries to the animal. Cage traps can be expensive to purchase.

Trap monitors are devices that send a radio signal to a receiver if a set trap is disturbed and alerts field personnel that an animal may be captured. Trap monitors can be attached directly to the trap or attached to a string or wire and then placed away from the trap in a tree or shrub. When the monitor is hung above the ground, it can be detected from several miles away, depending on the terrain in the area. There are many benefits to using trap monitors, such as saving considerable time when checking traps, decreasing fuel usage, prioritizing trap checks, and decreasing the need for human presence in the area.

Trap monitoring devices would be employed, when applicable, that indicate when a trap has been activated. Trap monitoring devices would allow personnel to prioritize trap checks and decrease the amount of time required to check traps, which decreases the amount of time captured target or non-targets would be restrained. By reducing the amount of time targets and non-targets are restrained, pain and stress can be minimized and captured wildlife can be addressed in a timely manner, which could allow non-targets to be released unharmed. Trap monitoring devices could be employed where applicable to facilitate monitoring of the status of traps in remote locations to ensure any captured wildlife was removed promptly to minimize distress and to increase the likelihood non-targets could be released unharmed.

Denning is the practice of locating coyote or fox dens and lethally removing the young, adults or both to stop an ongoing predation problem or prevent future depredation of livestock. Denning is used in coyote and fox damage management, but is limited because dens are often difficult to locate and den use by the

target animal is restricted to about 2 to 3 months during the spring. Coyote depredations on livestock and poultry often increase in the spring and early summer due to the increased food requirements associated with feeding and rearing litters of pups (Till and Knowlton 1983, Till 1992). Removal of pups will often stop depredations even if the adults are not taken (Till 1992). When the adults are taken at or near a known den location, it is customary to euthanize the pups to prevent their starvation because they would be unable to survive on their own. Pups are typically euthanized by digging out the den and euthanizing the pups with sodium pentobarbital (see discussion of sodium pentobarbital). Denning is labor intensive with no guarantee of finding the den of the target animal. Denning is very target-specific and is most often used in open terrain where dens are comparatively easy to find.

Harvest during the Hunting/Trapping Season is sometimes recommended by WS to resource owners. WS could recommend resource owners consider legal hunting/trapping as an option for reducing predator damage. Although legal hunting/trapping is impractical and/or prohibited in many urban-suburban areas, it can be used to reduce some local populations of predators.

Shooting with firearms is very selective for the target species and would be conducted with rifles, handguns, and shotguns. Methods and approaches used by WS may include use of vehicles or aircraft, illuminating devices, bait, firearm suppressors, night vision/thermal equipment, and elevated platforms. Shooting is an effective method in some circumstances, and can often provide immediate relief from the problem. Shooting may at times be one of the only methods available to effectively and efficiently resolve a wildlife problem.

Ground shooting is sometimes used as the primary method to alleviate damage or threats of damage. Shooting predators is frequently performed in conjunction with calling, particularly for coyotes. Vocal calls, handheld mouth-blown calls, and electronic calls could be used to mimic target species (*e.g.*, coyote howls and raccoons fighting) or prey (*e.g.*, injured jackrabbit and chicken) vocalizations. Shooting would be limited to locations where it is legal and safe to discharge a weapon. A shooting program, especially conducted alone, can be expensive because it often requires many staff hours to complete.

Shooting can also be used in conjunction with an illumination device at night, which is especially useful for nocturnal animals, such as coyotes. Spotlights may or may not be covered with a red lens, which nocturnal animals may not be able to see, making it easier to locate them undisturbed. Night shooting may be conducted in sensitive areas that have high public use or other activity during the day, which would make daytime shooting unsafe. The use of night vision and Forward Looking Infrared (FLIR) devices can also be used to detect and shoot predators at night, and is often the preferred equipment due to the ability to detect and identify animals in complete darkness. Night vision and FLIR equipment aid in locating animals at night when animals may be more active. Night vision and FLIR equipment could be used during surveys and in combination with shooting to remove target animals at night. WS' personnel most often use this technology to target animals in the act of causing damage or likely responsible for causing damage. Those methods aid in the use of other methods or allow other methods to be applied more selectively and efficiently. Night vision and FLIR equipment allow for the identification of target species during night activities, which reduces the risks to non-targets and reduces human safety risks. Night vision equipment and FLIR devices only aid in the identification of animals and are not actual methods of lethal removal. The use of FLIR and night vision equipment to remove target animals would increase the selectivity of direct management activities by targeting those animals most likely responsible for causing damage or posing threats.

Aerial Shooting (*i.e.*, shooting from an aircraft) is a commonly used damage management method for coyotes. Aerial shooting can be especially effective in removing offending coyotes that have become “*bait-shy*” to trap sets or are not susceptible to calling and shooting. Aerial shooting consists of visually sighting target animals in the problem area and personnel shooting the animal from the aircraft. Local

depredation problems (*e.g.*, calf predation by coyotes) can often be resolved quickly through aerial shooting. Aerial shooting is mostly species-selective (there is a slight potential for misidentification) and can be used for immediate control to reduce livestock and natural resource losses if weather, terrain, and cover conditions are favorable. Fixed-wing aircraft are most frequently used in flat and gently rolling terrain whereas helicopters with better maneuverability have greater utility and are safer over brush covered ground, timbered areas, steep terrain, or broken land where animals are more difficult to spot.

Cain et al. (1972) rated aerial shooting as “*very good*” in effectiveness for problem solving, safety, and lack of adverse environmental impacts. Connolly and O’Gara (1987) documented the efficacy of aerial shooting in taking confirmed sheep-killing coyotes. Wagner (1997) and Wagner and Conover (1999) found that aerial shooting might be an especially appropriate tool as it reduces risks to non-target animals and minimizes contact between damage management operations and recreationists. They also stated that aerial shooting was an effective method for reducing livestock predation and that aerial hunting 3 to 6 months before sheep are grazed on an area was cost-effective when compared with areas without aerial hunting.

Good visibility and relatively clear and stable weather conditions are required for effective and safe aerial shooting. Summer conditions limit the effectiveness of aerial shooting as heat reduces coyote activity and visibility is greatly hampered by vegetative ground cover. Air temperature (high temperatures), which influences air density affects low-level flight safety and may restrict aerial shooting activities. In broken timber or deciduous cover, aerial shooting is more effective in winter when the leaves have fallen or in early spring before the leaves emerge, which improves visibility. The WS program aircraft-use policy helps ensure that aerial shooting is conducted in a safe and environmentally sound manner, in accordance with federal and state laws. Pilots and aircraft must be certified under established WS program procedures and only properly trained WS’ employees are approved as gunners. Ground crews are often used with aerial operations for safety reasons. Ground crews can also assist with locating and recovering target animals, as necessary.

Aircraft overflights have created concerns about disturbing wildlife. The National Park Service (1995) reviewed studies on the effects of aircraft overflights on wildlife. Their report revealed that a number of studies documented responses by certain wildlife species that could suggest adverse impacts may occur. Few, if any studies, have proven that aircraft overflights cause significant adverse impacts to wildlife populations, although the report stated it is possible to draw the conclusion that affects to populations could occur. It appears that some species will frequently, or at least occasionally, show adverse responses to even minor overflight occurrences. In general, it appears that the more serious potential impacts occur when overflights are frequent, such as hourly, and over long periods of time, which represents chronic exposure. Chronic exposure situations generally occur in areas near commercial airports and military flight training facilities. The use of firearms from aircraft would occur in remote areas where tree cover and vegetation allows for visibility of target animals from the air. WS spends relatively little time over any one area.

WS has used fixed-wing aircraft and helicopters for aerial shooting in areas inhabited by wildlife for years. WS conducts aerial activities on areas only under signed agreement and concentrates efforts during certain times of the year and to specific areas. WS flies very little over any one property under agreement in any given year. As a result, no known problems to date have occurred with WS’ aerial shooting overflights on wildlife, nor are they anticipated in the future.

Aerial Surveying is a commonly used tool for evaluating and monitoring damage and establishing population estimates and locations of various species of wildlife. WS uses aerial surveying throughout the United States to monitor damages and/or populations of coyotes, fox, wolves, feral swine, feral goats, feral dogs, bobcats, mountain lions, white-tailed deer, pronghorn antelope, elk, big-horn sheep, and wild

horses but any wildlife species big enough to see from a moving aircraft could be surveyed using this method. As with aerial shooting, the WS program aircraft-use policy helps ensure that aerial surveys are conducted in a safe and environmentally sound manner, in accordance with federal and state laws. Pilots and aircraft must also be certified under established WS program procedures and policies.

Aerial Telemetry is used in research projects studying the movements of various wildlife species. Biologists will frequently place radio-transmitting collars on selected individuals of a species and then monitor their movements over a specified period. Whenever possible, the biologist attempts to locate the research subject using a hand-held antennae and radio receiver, however, occasionally animals will make large movements that prevent biologists from locating the animal from the ground. In these situations, WS can utilize either fixed wing aircraft or helicopters and elevation to conduct aerial telemetry and locate the specific animal wherever it has moved to. As with any aerial operations, the WS program aircraft-use policy helps ensure that aerial surveys would be conducted in a safe and environmentally sound manner, in accordance with federal and state laws.

Trained Dogs are frequently used in predator damage management to locate, pursue, or decoy animals. The WS program could use trailing/tracking, decoy, and trap-line companion dogs. Training and maintaining suitable dogs requires considerable skill, effort, and expense. WS Directive 2.445 establishes standards and responsibilities for WS' use of trained dogs to assist in accomplishing activities. When using trained dogs, WS' personnel would adhere to WS Directive 2.445.

Tracking Dogs or trailing dogs are commonly used to track and “*tree*” target wildlife species, such as mountain lions, bobcats, and raccoons. Although not as common, they sometimes are trained to track coyotes (Rowley and Rowley 1987, Coolahan 1990). Dogs commonly used are different breeds of hounds, such as blue tick, red-bone, and Walker. They become familiar with the scent of the animal they are to track and follow, and the dogs strike (howl) when they detect the scent. Tracking dogs are trained not to follow the scent of non-target species. Personnel of WS typically find the track of the target species at fresh kills or drive through the area of a kill site until the dogs strike. Personnel would then put their dogs on the tracks of the target predator. Typically, if the track is not too old, the dogs can follow the trail and tree the animal. The animal usually seeks refuge up a tree, in a thicket on the ground, on rocks or a cliff, or in a hole. The dogs stay with the animal until personnel arrive and dispatch, tranquilize, or release the animal, depending on the situation. A possibility exists that dogs could switch to a fresher trail of a non-target species while pursuing the target species. This could occur with any animal that they have been trained to follow, and could occur with an animal that is similar to the target species. For example, dogs on the trail of a mountain lion could switch to a bobcat, if they cross a fresher track. With this said, this risk can be minimized greatly by the personnel of WS looking at the track prior to releasing the dogs and calling them off a track if it is determined that they have switched tracks.

Decoy Dogs are primarily used in coyote damage management in conjunction with calling. Dogs are trained to spot and lure coyotes into close shooting range for personnel of WS. Decoy dogs are especially effective for territorial pairs of coyotes. Decoy dogs are typically medium-sized breeds that are trained to stay relatively close to personnel.

Trap-line Companion Dogs could accompany personnel of WS in the field while they were setting and checking equipment. They would be especially effective in finding sites to set equipment by alerting their owners to areas where coyotes or other predators have traveled, urinated, or defecated, which are often good sites to make sets. Trap-line companion dogs stay with personnel and most always have no effect on non-target animals. Trap-line dogs may increase the selectivity towards territorial coyotes by identifying territorial canine scent locations.

Chemical Wildlife Damage Management Methods

The EPA through the FIFRA, the NDDA, the United States Drug Enforcement Administration, MOUs with land managing agencies, and WS' directives would regulate chemical methods that could be available for use by WS pursuant to the alternatives (see WS Directive 2.401, WS Directive 2.405, WS Directive 2.430, WS Directive 2.465). All pesticides used by WS would be registered under the FIFRA and administered by the EPA and the NDDA. All WS' personnel in North Dakota who apply restricted-use pesticides would be certified for pesticide application. The EPA and the NDDA require pesticide applicators to adhere to all certification requirements set forth in the FIFRA. Pharmaceutical drugs, including those used in wildlife capture and handling, are administered by the United States Food and Drug Administration and/or the United States Drug Enforcement Administration. Employees of WS that use immobilizing drugs and euthanasia chemicals would be certified for their use and follow the guidelines established in the WS Field Operational Manual for the Use of Immobilization and Euthanasia Drugs (Johnson et al. 2001).

Chemicals would not be used by WS on public or private lands without authorization from the land management agency or property owner or manager. Under certain circumstances, personnel of WS could be involved in the capture of animals where the safety of the animal, personnel, or the public could be compromised and chemical immobilization would provide a good solution to reduce those risks. For example, chemical immobilization could be used to capture coyotes where public safety was at risk. Immobilizing drugs are most often used by WS to remove animals from cage traps to be examined (*e.g.*, for disease surveillance) or in areas such as urban, recreational, and residential areas where the safe removal of a problem animal is most easily accomplished with a drug delivery system (*e.g.*, darts from rifle). Immobilization is usually followed by release (*e.g.*, after radio collaring a coyote for a study), translocation, or euthanasia. Chemically euthanized animals would be disposed of by incineration or deep burial to avoid secondary hazards. Immobilizing drugs and euthanasia chemicals would be monitored closely and stored in locked boxes or cabinets according to WS' policies and United States Drug Enforcement Administration guidelines. Most drugs fall under restricted-use categories and must be used under the appropriate license from the United States Drug Enforcement Administration. The following chemical methods have been proven to be selective and effective in reducing damage by predators.

Chemical Immobilization Drugs

Ketamine (Ketamine HCl) is a fast acting dissociative anesthetic (*i.e.*, loss of sensation with or without loss of consciousness) that is used to capture animals. Ketamine produces catatonia (*i.e.*, lack of movement, activity, or expression) and profound analgesia (*i.e.*, insensibility to pain without loss of consciousness), but not muscle relaxation. It is used to eliminate pain, calm fear, and allay anxiety. Ketamine is possibly the most versatile drug for chemical capture, and it has a wide safety margin (Johnson et al. 2001). When used alone, this drug may produce muscle tension, resulting in shaking, staring, increased body heat, and, on occasion, seizures. Usually, ketamine is combined with other drugs, such as xylazine. The combination of such drugs is used to control an animal, maximize the reduction of stress and pain, and increase human and animal safety.

Telazol is a more powerful anesthetic and usually used for larger animals. Telazol is a combination of equal parts of tiletamine hydrochloride and zolazepam hydrochloride (a tranquilizer). The product is generally supplied sterile in vials, each containing 500 mg of active drug, and when dissolved in sterile water has a pH of 2.2 to 2.8. Telazol produces a state of unconsciousness in which protective reflexes, such as coughing and swallowing, are maintained during anesthesia. Schobert (1987) listed the dosage rates for many wild and exotic animals. Before using Telazol, the size, age, temperament, and health of the animal are considered. Following a deep intramuscular injection of Telazol, onset of anesthetic effect usually occurs within 5 to 12 minutes. Muscle relaxation is optimum for about the first 20 to 25 minutes

after the administration, and then diminishes. Recovery varies with the age and physical condition of the animal and the dose of Telazol administered, but usually requires several hours.

Xylazine is a sedative (analgesic) that calms nervousness, irritability, and excitement, usually by depressing the central nervous system. Xylazine is commonly used with ketamine to produce a relaxed anesthesia. It can also be used alone to facilitate physical restraint. Because xylazine is not an anesthetic, sedated animals are usually responsive to stimuli. Therefore, personnel should be even more attentive to minimizing sight, sound, and touch. When using ketamine/xylazine combinations, xylazine will usually overcome the tension produced by ketamine, resulting in a relaxed, anesthetized animal (Johnson et al. 2001). This reduces heat production from muscle tension, but can lead to lower body temperatures when working in cold conditions.

Chemical Euthanasia Methods

Sodium Pentobarbital is a barbiturate that rapidly depresses the central nervous system to the point of respiratory arrest. Barbiturates are a recommended euthanasia drug for free-ranging wildlife (AVMA 2013). Sodium pentobarbital would only be administered after target animals have been live-captured and properly immobilized to allow for direct injection. There are United States Drug Enforcement Administration restrictions on who can possess and administer this drug. Some states may have additional requirements for personnel training and particular sodium pentobarbital products available for use in wildlife. Certified WS' personnel are authorized to use sodium pentobarbital and dilutions for euthanasia in accordance with United States Drug Enforcement Administration and state regulations. All animals euthanized using sodium pentobarbital and all of its dilutions (*e.g.* Beuthanasia-D, Fatal-Plus) would be disposed of immediately through incineration or deep burial to prevent secondary poisoning of scavenging animals and introduction of these chemicals to non-target animals.

Potassium Chloride used in conjunction with prior general anesthesia is used as a euthanasia agent for animals, and is considered acceptable and humane by the AVMA (2013). Animals that have been euthanized with this chemical experience cardiac arrest followed by death, and are not toxic to predators or scavengers.

Beuthanasia®-D combines pentobarbital with another substance to hasten cardiac arrest. Intravenous (IV) and intracardiac (IC) are the only acceptable routes of injection. As with pure sodium pentobarbital, IC injections with Beuthanasia®-D are only acceptable for animals that are unconscious or deeply anesthetized. With other injection routes, there are concerns that the cardiotoxic properties may cause cardiac arrest before the animal is fully unconscious. It is a Schedule III drug, which means it can be obtained directly from the manufacturer by anyone with a United States Drug Enforcement Administration registration. However, Schedule III drugs are subject to the same security and record-keeping requirements as Schedule II drugs.

Fatal-Plus® combines pentobarbital other substances to hasten cardiac arrest. IV is the preferred route of injection; however, IC is acceptable as part of the two-step procedure used by WS. Animals are first anesthetized and sedated using a combination of ketamine/xylazine and once completely unresponsive to stimuli and thoroughly sedated, Fatal-Plus® is administered. Like Beuthanasia®-D, it is a Schedule III drug requiring a United States Drug Enforcement Administration registration for purchase and is subject to the security and record-keeping requirements of Schedule II drugs.

Carbon dioxide is sometimes used to euthanize animals that are captured in live traps and when relocation is not a feasible option. Live animals are placed in a sealed chamber. CO₂ gas is released into the chamber and the animal quickly dies after inhaling the gas. This method is approved as a euthanizing agent by the AVMA. CO₂ gas is a byproduct of animal respiration, is common in the atmosphere, and is

required by plants for photosynthesis. It is used to carbonate beverages for human consumption and is the gas released by dry ice. The use of CO₂ by WS for euthanasia purposes is exceedingly minor and inconsequential to the amounts used for other purposes by society.

Repellents

Repellents are usually naturally occurring substances or chemicals formulated to be distasteful or to elicit pain or discomfort for target animals when they are smelled, tasted, or contacted. Repellents are non-lethal chemical formulations used to discourage or disrupt particular animal behaviors. Olfactory repellents must be inhaled to be effective. These are normally gases, or volatile liquids and granules, and require application to areas or surfaces that need protecting. Taste repellents are compounds (*e.g.*, liquids, dusts, granules) that are normally applied to trees, shrubs, and other materials that are likely to be eaten or gnawed by the target species. Tactile repellents are normally thick, liquid-based substances that are applied to areas or surfaces to discourage travel of wildlife by causing irritation such as to the feet.

Only a few repellents are commercially available for mammals, and are registered for only a few species. Repellents would not be available for many species that may present damage problems, such as some predators or furbearing species. For example, Miller et al. (2014) found a commonly available mammal repellent was not effective at repelling coyotes. Repellents are variably effective and depend largely on resource to be protected, time and length of application, and sensitivity of the species causing damage. Acceptable levels of damage control would usually not be realized unless repellents were used in conjunction with other techniques.

Fumigants

Large Gas cartridges (EPA Reg. No. 56228-21) are often used to treat dens or burrows of coyotes, fox, or skunks. When ignited, the cartridge burns in the den of an animal and produces large amounts of carbon monoxide, a colorless, odorless, and tasteless, poisonous gas. The combination of oxygen depletion and carbon monoxide exposure kills the animals in the burrow or den. Sodium nitrate is the principle active chemical in gas cartridges and is a naturally occurring substance. Although stable under dry conditions, it is readily soluble in water and likely to be highly mobile in soils. In addition, dissolved nitrate is very mobile, moving quickly through the vadose zone to the underlying water table (Bouwer 1989). However, burning sodium nitrate, as in the use of a gas cartridge as a fumigant in a rodent burrow, is believed to produce mostly simple organic and inorganic gases, using all of the available sodium nitrate. In addition, the human health drinking water tolerance level for this chemical is 10 mg / L, a relatively large amount, according to EPA Quality Criteria for Water (EPA 1986, Wallace 1987). The gas, along with other components of the cartridge, are likely to form oxides of nitrogen, carbon, phosphorus, and sulfur. Those products are environmentally non-persistent because they are likely to be metabolized by soil microorganisms or they enter their respective elemental cycles. In rodent cartridges, sodium nitrate is combined with seven additional ingredients: sulfur, charcoal, red phosphorus, mineral oil, sawdust, and two inert ingredients. None of the additional ingredients in this formulation is likely to accumulate in soil, based on their degradation into simpler elements by burning the gas cartridge. Sodium nitrate is not expected to accumulate in soils between applications, nor does it accumulate in the tissues of target animals (EPA 1991). The EPA stated sodium nitrates “...as currently registered for use as pesticides, do not present any unreasonable adverse effects to humans” (EPA 1991). WS would only use gas cartridges in dens that show signs of active target animal use to minimize risks to non-target species.

Toxicants

Sodium Cyanide (EPA Reg. No. 56228-15) is used in the M-44 device, a spring-activated ejector device developed specifically to kill coyotes and other canids. The M-44 is a mechanical device that ejects

sodium cyanide powder into the mouth of an animal that pulls up on it with its teeth. The M-44 is made of four parts and is set with special pliers. It is selective for canids (members of the dog family) due to their feeding behavior (scavenging) and because the attractants used are relatively canid-specific. When properly used, the M-44 device presents little risk to humans and the environment, and provides an additional tool to reduce predator damage. The M-44 device consists of: (1) a capsule holder wrapped with fur, cloth, or wool; (2) a capsule containing 0.97 grams of powdered sodium cyanide; (3) an ejector mechanism; and (4) a 5-7 inch hollow stake. The hollow stake is driven into the ground, the ejector unit is cocked and placed in the stake, and the capsule holder containing the cyanide capsule is screwed onto the ejector unit. A fetid meat or other suitable bait is spread on the capsule holder. A canine attracted by the bait will try to pick up or pull the baited capsule holder. When the M-44 device is pulled, a spring-activated plunger propels sodium cyanide into the animal's mouth. When it encounters carbon dioxide or acids, it forms hydrogen cyanide gas. Hydrogen cyanide gas is highly and quickly toxic by contact, ingestion, or inhalation of vapors at which time it enters the bloodstream. Hydrogen cyanide gas is an asphyxiant that prohibits the use of oxygen, which affects cellular activities and functions of all tissues in the body. The body is unable to use oxygenated blood (arterial blood). The body will respond to cyanide poisoning with a variety of symptoms depending on the amount of exposure. The characteristic response is a rapid loss of consciousness and cessation of breathing except with the mildest of exposures. After ingestion of a large dose of sodium cyanide, the target species may become unconscious within a few seconds. Breathing is rapid at first, but soon becomes slow and gasping. Convulsions may follow, but in severe poisoning cases, especially if untreated, coma and death may occur in a few minutes. M-44 users carry an antidote kit that consists of six amyl nitrite pearls while setting out or checking the devices. WS personnel must have a commercial pesticide applicators license issued by the NDDA to use the M-44. The EPA label for the M-44 includes 26 use restrictions, which must be followed. Only WS personnel can use the device in North Dakota.

APPENDIX C

USFWS Biological Opinion: Reasonable and Prudent Measures to Minimize Gray Wolf Take:

The USFWS believes the following reasonable and prudent measures are necessary and appropriate to minimize impacts of incidental take of gray wolves in association with predator damage control activities targeted to reduce coyote depredation:

1. Survey the project area for sign indicating wolf activity prior to setting foothold traps, neck snares, or M-44 devices to control coyotes.
2. Rely on aerial hunting or shooting to control coyotes if wolf sign is detected and there has not been verified loss of livestock attributed to wolves.
3. Notify the North Dakota Field Office, Field Supervisor, concerning reported and verified wolf sightings or sign reported in the state within 5 working days.
4. Report the incidental take of a gray wolf to the North Dakota Field Office-Ecological Services and Law Enforcement within 24 hours of the discovery.
5. Prepared a detailed report describing the circumstances that lead to the loss or injury of the gray wolf, including recommendations concerning how future losses can be avoided.

Terms and Conditions for implementation of Reasonable and Prudent Measures:

In order to be exempt from the prohibitions of Section 9 of the Act, Wildlife Services must comply with the following terms and conditions, which implement the reasonable and prudent measures, described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary.

1. To implement Reasonable and Prudent Measure number 1 and 2, Wildlife Services will investigate the project area for wolf sign prior to setting foothold traps, neck snares, or M-44 devices to control coyote depredation. The investigation shall include interviewing the landowner and evaluating evidence at the site where a loss of livestock has occurred. If wolf sign is detected and the verified loss is attributable to coyotes but not wolves, Wildlife Services will control coyotes using methods that require positive identification of the target species, i.e. aerial hunting or shooting. The use of other coyote damage control methods can resume provided no additional wolf sign is detected during the next 7 days.
2. Reasonable and Prudent Measures 3,4, and 5 address notification and reporting requirements for wolf sightings in North Dakota. Transferring information in a timely manner allows the agencies with responsibilities for conservation and management of gray wolves to make sound decisions concerning the species.

APPENDIX D

North Dakota Game and Fish Department Analysis of WS' Furbearer Take



Report: Analysis of Wildlife Services removal activities on furbearers in North Dakota

To: Phil Mastrangelo
From: Stephanie Tucker
Date: May 15, 2015
CC: Jeb Williams, Casey Anderson

As requested, I've completed some graphical analysis comparing furbearer trends to lethal removal of coyotes (*Canis latrans*), red fox (*Vulpes vulpes*), and raccoon (*Procyon lotor*) by Wildlife Services (WS). This was done to determine whether or not WS' removal activities are having any negative impacts to these furbearer populations. All three species of furbearers are found statewide and considered abundant, with coyotes having the highest densities (Seabloom et al. 2011, Tucker 2015). WS' removal activities typically take place on 3%, <0.1%, <0.1% of the species' range in North Dakota for coyotes, red foxes, and raccoons, respectively. Thus, the proportion of each species range affected annually by WS' removal activities is negligible.

Coyote trends are documented annually via surveys conducted by rural mail carriers each spring, which research has shown is an accurate method of indexing both foxes and coyotes in North Dakota (Allen and Sargeant 1975; Tucker 2015). Increases and decreases in the number of coyotes removed by WS annually generally follow rural mail carrier trends of coyotes ($R^2 = 0.48$; Figures 1-2). This indicates that the number of coyotes removed by WS annually is not impacting coyote trends, but may instead be a reliable index of the statewide coyote population.

Increases and decreases in the number of red foxes removed by WS annually does not closely resemble rural mail carrier trends of red foxes as it did that of coyotes ($R^2 = 0.00$; Figure 3). And, the number of red foxes removed by WS each year has no impact on estimated red fox density the following year (Figure 4). However, the number red foxes removed by WS annually is minimal and substantially lower than the number purchased by fur buyers, which represents the minimum number of red foxes taken by fur harvesters (Figure 5). Therefore, there is no indication that the number of red foxes removed by WS annually is impacting red fox populations.

Similar to red fox, increases and decreases in the number of raccoons removed by WS annually does not closely resemble rural mail carrier trends of raccoons as it did that of coyotes ($R^2 =$

0.03; Figure 6). The number of raccoons removed annually by Wildlife Services is once again minimal and substantially lower than the number taken by fur harvesters (Figure 5). Therefore, there is no indication that the number of raccoons removed by WS annually is impacting raccoon populations.

Additionally, WS annually removes a small number of badgers ($\bar{x} = 15$; *Taxidea taxus*), bobcats ($\bar{x} = 1$; *Lynx rufus*), fishers ($\bar{x} = 1$; *Pekania pennanti*), mink ($\bar{x} = 1$; *Mustela vison*), and striped skunks ($\bar{x} = 24$; *Mephitis mephitis*). All of these species of furbearers, except striped skunks, are considered common or abundant in their available habitats and have open hunting and trapping seasons. Striped skunks are unprotected in North Dakota and found statewide in abundant numbers; therefore, they can be taken by anyone at any time of the year. The amount of removal conducted by WS on these species is minuscule and of no concern to their population sustainability or management.

Over the past 10 years, WS has removed 1 mountain lion (*Puma concolor*) at the request of our Department. This particular mountain lion had been depredating domestic calves. The removal of 1 mountain lion over a 10-year period did not have a negative impact on the population sustainability and management of mountain lions in North Dakota.

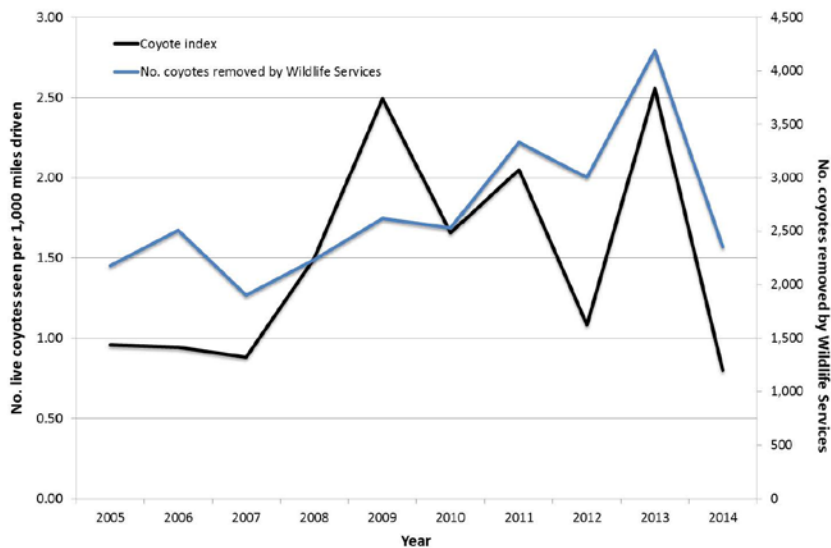


Figure 1. Index of coyotes (no. live coyotes seen per 1,000 miles driven) as documented by rural mail carriers during spring of each year in North Dakota, 2005-2014. In comparison, number of coyotes lethally removed by Wildlife Services annually.

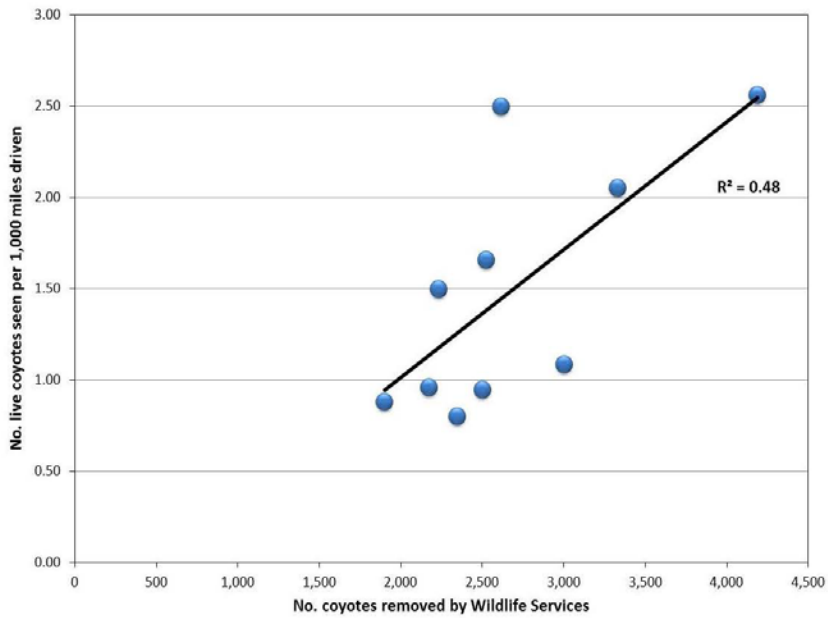


Figure 2. Comparison between numbers of coyotes lethally removed by Wildlife Services each year and an index of coyotes (no. live coyotes seen per 1,000 miles driven).

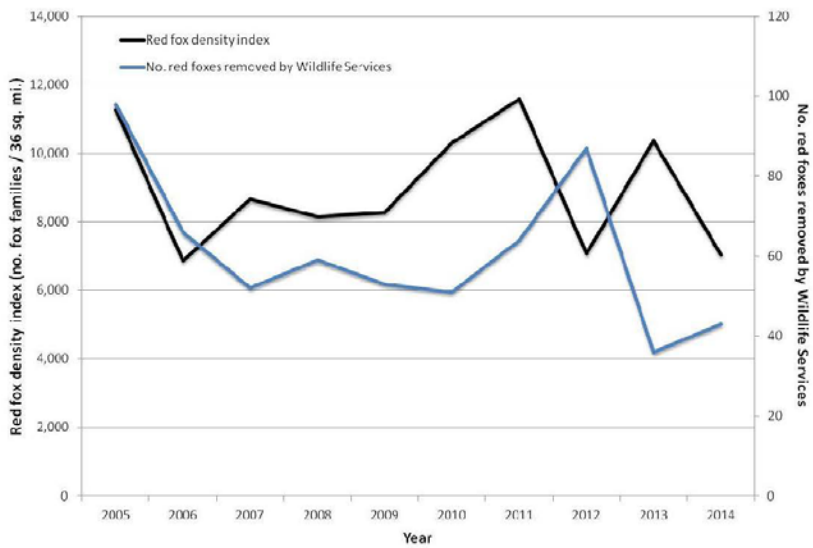


Figure 3. Index of red fox density as documented by rural mail carriers during spring of each year in North Dakota, 2005-2014. In comparison, number of red foxes lethally removed by Wildlife Services annually.

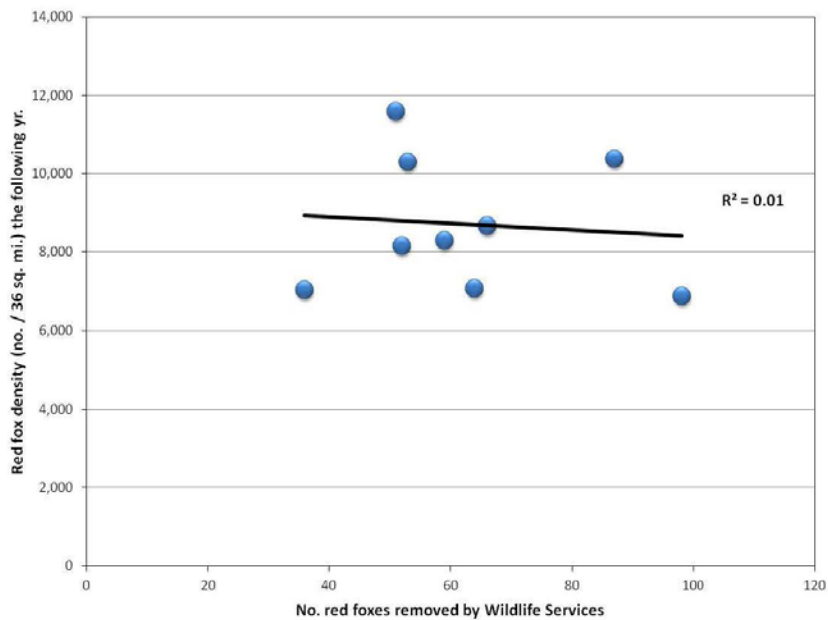


Figure 4. Comparison between the number of red foxes lethally removed by Wildlife Services each year and red fox density following the removal for a 10-year time period.

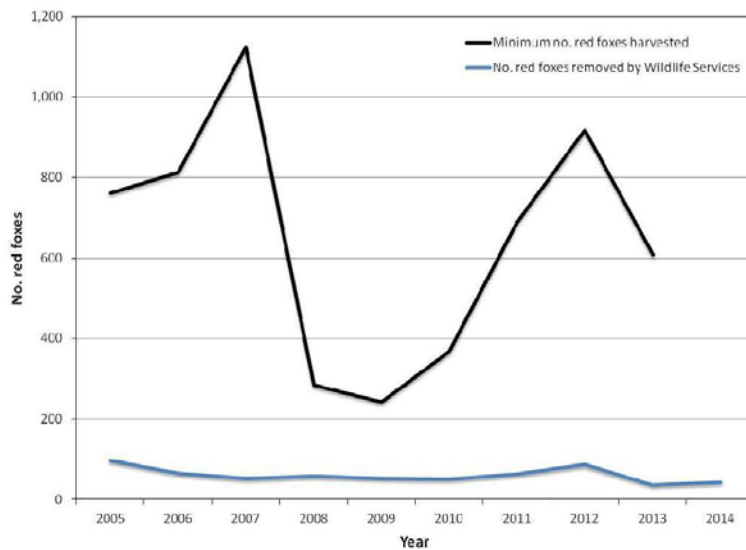


Figure 5. Numbers of red foxes removed by Wildlife Services and taken by fur harvesters (hunters and trappers) annually in North Dakota, 2005-2014.

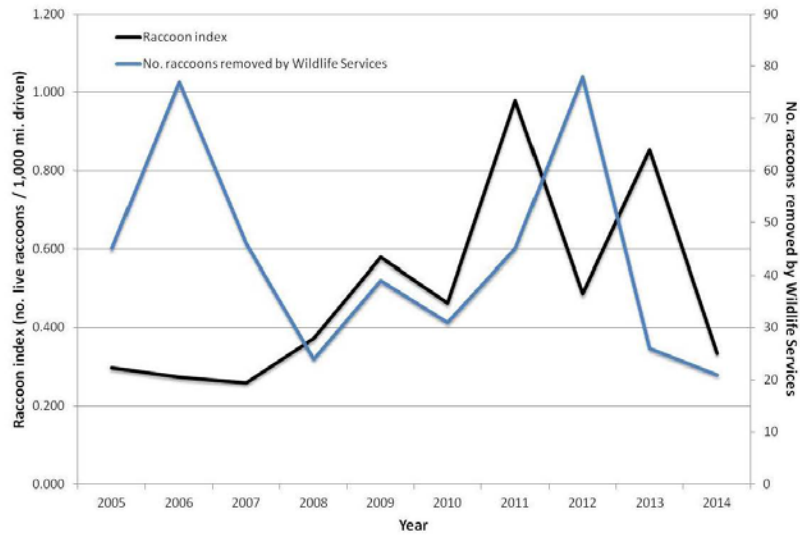


Figure 6. Index of raccoons as documented by rural mail carriers during spring of each year in North Dakota, 2005-2014. In comparison, number of raccoons lethally removed by Wildlife Services annually.

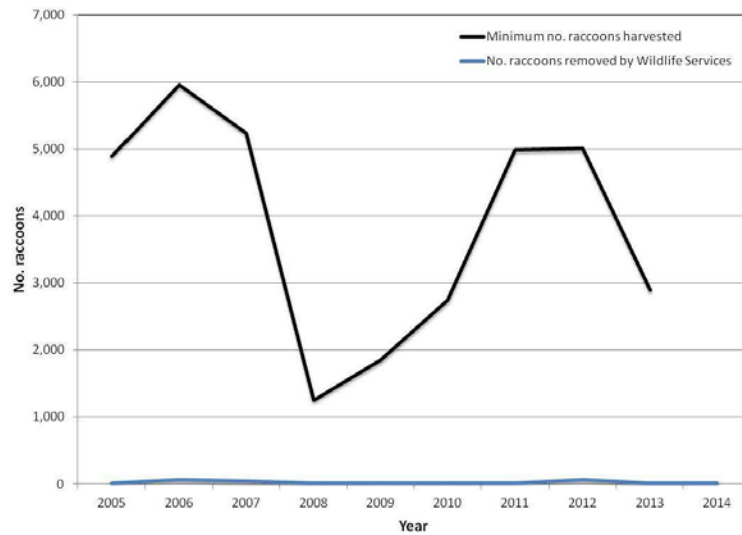


Figure 7. Numbers of raccoons removed by Wildlife Services and taken by fur harvesters (hunters and trappers) annually in North Dakota, 2005-2014.

APPENDIX E
WS' RESPONSE TO EVALUATION OF STUDIES BY TREVES ET AL. (2016)

Treves et al. (2016) evaluated 12 existing publications (5 non-lethal and 7 lethal methods) regarding the effectiveness of non-lethal and lethal methods for reducing predation on livestock. Their main conclusions included the following:

- Predator control methods to prevent livestock loss have rarely been subject to rigorous tests using the “*gold standard*” for scientific inference (random assignment to control and treatment groups with experimental designs that avoid biases in sampling, treatment, measurement, or reporting)
- Across the controlled experiments that they systematically examined, higher standards of evidence were generally applied in tests of non-lethal methods than in tests of lethal methods for predator control
- Non-lethal methods were more effective than lethal methods in preventing carnivore predation on livestock generally; at least two lethal methods (government culling or regulated, public hunting) were followed by increases in predation on livestock; zero tests of non-lethal methods had counterproductive effects
- All flawed tests came from North America; ten of 12 flawed tests were published in three journals, compared to four of 12 tests with strong inference in those same journals
- Treves et al. (2016) recommend suspending lethal predator control methods that do not currently have rigorous evidence for functional effectiveness in preventing livestock loss until gold standard tests are completed.

Specific Points Regarding the Article by Treves et al. (2016):

- Treves et al. (2016) recommend wildlife researchers apply the same standards used in controlled, laboratory settings to wildlife field research. Such standards (which involve randomized, controlled trials) are often not possible in field studies for a variety of reasons:
 - First, it can be difficult to find comparable units for evaluation. In the case of predation management, finding multiple field study sites that not only prohibit predator control, but also allow ranching, is difficult. Almost by definition, ranchers with high predation rates usually try to control predators, and ranchers with minimal problems do not.
 - Second, field studies involve a lot of variation. There are many factors from the weather to varying habitats to the movement of wildlife in and out of study areas that cannot be controlled and may affect results. This is the inherent nature of fieldwork.
 - Finally, to give sufficient statistical power, sample sizes must be large. Gathering sufficient data often involves multiple field seasons and field experts. Funding and other resources can limit the ability to conduct such studies.
- To conduct a completely randomized design, as suggested by Treves et al. (2016), would result in inherently large variability among sites and would necessitate such a large sample size that it would not be possible or practical in most instances. Two alternative field designs that are commonly used in wildlife research include a switch-back and paired block approach.
 - In the case of a predator control study, a switch-back design would involve at least two study areas, one (or more) with predator control and one (or more) without predator control. After at least 2 years of data collection, the sites would switch so that the one with predator control becomes the one without predator control and vice versa. An additional 2 years of data collection would occur. Research scientists with WS are currently involved in a controlled switch-back study like the one described above that is investigating the effectiveness of coyote control for reducing predation on deer populations in Utah.

- The paired block design, involves finding multiple sites that are similar that can be paired and compared. For each pair, one site would experience predator control and one would not.
- The sloppy assessment of existing predation studies from North America and Europe by Treves et al. (2016) causes us to question their ability to accurately critique the scientific literature. Treves et al. (2016) did not accurately interpret or represent the designs and results of at least two of the studies reviewed in their paper.
- In regards to Wagner and Conover (1999), Treves et al. (2016) makes a fundamental error in interpreting the study design. When researchers make changes to the independent variable, they measure the changes in the dependent variable. The purpose of the study was to determine the impact of preventive aerial operations (independent variable) as currently practiced by the WS program on sheep losses the following summer (dependent variable) AND the need for subsequent corrective predator damage management (*i.e.*, the use of traps snares and M-44 devices - also a dependent variable) during the subsequent summer. Treves et al. (2016) mistakenly characterize use of traps, snares, and M-44 devices as independent variables which indicates a fundamental inattentiveness to the details of the study. This error led the authors to erroneously claim a variation that occurred in response to the treatment was either a willful misapplication of a control variable or a gross failure in study design. Wagner and Conover (1999) purposefully allowed corrective predator damage management to be conducted during the summer following aerial operations because, as practiced, it was highly improbable that preventive aerial operations would ever be used to the exclusion of all other methods for corrective predator damage management. Furthermore, if preventive aerial operations were effective, authors predicted one of two outcomes:
 1. losses on areas without aerial operations would be lower than losses in areas with aerial operations and there would be a corresponding decrease in use of traps, snares and M-44 devices; or,
 2. increased use of corrective predation management during the summer could be sufficient to keep losses at levels similar to areas with preventive aerial operations, but the amount of summer corrective predation damage management would be higher in areas without aerial operations. Traps, snares, and M-44 devices pose substantially different risks to non-target species than aerial operations. Wagner and Conover (1999) felt that this information was important when making management decisions regarding the use of preventive aerial operations.

Treves et al. (2016) also states that the study is biased because “*control pastures started with 40% higher sheep densities.*” However, the Treves et al. (2016) calculation of sheep densities was based on incomplete information and is not a valid interpretation of the density of sheep during the study period. In the study, sheep were not permitted to disperse evenly throughout the grazing allotments; instead, herders moved sheep bands through subsections of the allotments in accordance with established grazing management plans. Consequently, simply dividing the number of sheep on the allotment by the total size of the allotment, as was done, does not accurately reflect the density of sheep during the study.

Treves et al. (2016) stated the study includes a reporting bias because “*data was not presented*” on livestock-guarding dogs. Wagner and Conover (1999) clearly stated that one of the criterion used for pairing allotments was the presence or absence of livestock guarding dogs. They did not pair allotments with livestock guarding dogs with allotments without livestock guarding dogs. Failure to provide data showing that that number of treated allotments with livestock guarding dogs matched the number of untreated allotments with livestock guarding dogs does not constitute a reporting bias.

- Treves et al. (2016) incorrectly cites and confuses two different studies when citing Bromley and Gese (2009) in their paper. While citing Bromley and Gese (2009), Treves et al. (2016) is actually referring to a paper published in 2001 by Bromley and Gese (2001a). As a reason for study bias, Treves et al. (2016) mentions the study conducted by Bromley and Gese (2001a) (incorrectly cited as Bromley and Gese 2009 in their paper) includes a high overlap between coyote territories “...because subsequent work showed that the home ranges and core areas of sterilized coyote packs overlapped territories of neighbors significantly more than those of intact coyote packs during the breeding season, when virtually all sheep predation occurred (Seidler and Gese 2012).” However, the “subsequent work” that Treves et al. (2016) cites by Seidler and Gese (2012) was actually associated with a study involving coyote predation on pronghorn (*Antilocapra americana*) fawns that Seidler (2009) conducted many years later in a different state and in a completely different system (*i.e.*, no sheep, different habitat types). Bromley and Gese (2001b) actually reports that coyote core areas overlapped only once (by 3%) and there was no statistically significant difference in overlap among coyote territories. In fact, to eliminate a potential inaccurate assignment of the coyotes responsible for making a kill, Bromley and Gese (2001a, 2001b) used the actual locations of the radioed coyotes as the method of assigning which coyote pack killed the sheep whenever there was overlap of territory boundaries between adjacent packs.
- Treves et al. (2016) included a paper by Musiani et al. (2003) that evaluated fladry as a non-lethal method to disperse wolves. However, a portion of the research conducted by Musiani et al. (2003) occurred on captive animals. The two field trials included in the paper by Musiani et al. (2003) did not meet the scientific standards outlined by Treves et al. (2016).
- Treves et al. (2016) selectively disregards studies from Australia. Those studies are some of the more rigorous field studies on working livestock operations with free-ranging, native carnivores that evaluate the effectiveness of lethal control. Given their explicit desire to make generalization about predation control, it is troublesome that Treves et al. (2016) would exclude this body of rigorous science.

WS understands and appreciates interest in ensuring predator damage management methods are as robust and effective as possible. WS supports the use of rigorous, scientifically sound studies, but we realize there are many variables that research scientist cannot control and assumptions that must be acknowledged when trying to answer complex ecological questions. WS does not believe there is a single standard for conducting wildlife field studies and each approach or design has its own unique assumptions, drawbacks, and challenges. WS does not believe that results from existing studies should be ignored. Wildlife research is inherently challenging because scientists are not working in a “closed” system. Science and the scientific method are a process. You build upon information gathered over years of study and experimentation. Results from one study lead to new questions and new studies.

WS’ policies and decisions are based on the best available science. The NEPA requires federal agencies to evaluate environmental impacts into their decision-making processes and to ensure that environmental information is available to public officials and citizens before a federal agency makes decisions and before the agency takes actions. To fulfill this responsibility, WS prepares analyses of the environmental effects of program activities as part of the NEPA process. A description of and citations for various wildlife damage management actions occurs in the EA and in Appendix B.

WS encourages the use of non-lethal tools and techniques when feasible and practical; however, not all wildlife damage problems can be resolved using non-lethal techniques alone. Even with the use of single or combined non-lethal methods, livestock losses to predators often continue. When conducting lethal management activities, WS evaluates all potential tools for humaneness, effectiveness, ability to target

specific individual animals and/or species, and the potential impact on human safety. Professional organizations such as The Wildlife Society, whose 10,000 members include scientists, managers, educators and others, have long supported the use of lethal removal. A Standing Position Statement issued by The Wildlife Society on wildlife damage management states, “*Prevention or control of wildlife damage, which often includes removal of the animals responsible for the damage, is an essential and responsible part of wildlife management.*” The mission of WS is to manage wildlife damage. WS does not manage wildlife populations. The management of predators and other wildlife is the responsibility of the other state and other federal agencies. As such, any actions taken by WS to reduce wildlife damage occurs in collaboration with state and federal agencies and under appropriate state and federal permits and laws.

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