FINAL ENVIROMENTAL ASSESSMENT

PREDATOR DAMAGE MANAGEMENT IN IDAHO

Prepared by the

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

in cooperation with

Idaho Department of Fish and Game

and in consultation with

Idaho Department of Agriculture
Idaho Department of Lands
Nez Perce Tribe
Shoshone-Bannock Tribes
United States Department of Agriculture Forest Service
United States Department of the Interior Fish and Wildlife Service
United States Department of the Interior Bureau of Land Management

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SUMMARY

Idaho wildlife has many positive values and is an important part of life in the State. However, as human populations expand, and land is used for human needs, there is increasing potential for conflicting human/wildlife interactions. This Environmental Assessment (EA) analyzes the potential environmental impacts of alternatives for United States Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Services in Idaho (WS-Idaho) involvement in resolving conflicts that are caused by predators in the State of Idaho. This includes animals preying upon or harassing livestock and wildlife; damaging other agricultural resources and property; or threatening human health and safety. The proposed wildlife damage management activities could be conducted on public, private and tribal property in Idaho when the property owner or manager requests assistance and/or when assistance is requested by an appropriate State, federal, tribal or local government agency.

Idaho predators addressed in this analysis that are involved in the majority of conflicts are coyotes (*Canis latrans*); black bears (*Ursus americana*); grizzly bears (*U. horribilus*); common ravens (*Corvus corax*) (hereafter referred as to ravens); bald and golden eagles (*Haliaeetus leucocephalus* and *Aquila chrysaetos*, respectively); mountain lions (*Felis concolor*); red foxes (*Vulpes vulpes*); striped skunks (*Mephitis mephitis)*; feral and free-ranging dogs (*C. familiaris*) (hereafter referred to as feral and free-ranging dogs); bobcats (*Lynx rufus*); raccoons (*Procyon lotor*); badgers (*Taxidea taxus*); and black-billed magpies (*Pica hudsonia*). Other predators in Idaho have historically caused only localized damage on an occasional basis and include feral and free-ranging cats (*F. domesticus*) (hereafter referred to as feral cats), mink (*Mustela vison*), long-tailed weasels (*M. frenata*), short- tailed weasels (*M. erminea*), American crows (*Corvus brachyrhynchos*), and western spotted skunks (*Spilogale gracilis*).

The proposed action (Alternative 5) continues the current WS-Idaho Predator Damage Management (PDM) activities using the full range of legally available methods in accordance with applicable federal, State and local laws (unless specifically exempt). However, it would also enable WS-Idaho to provide additional assistance in efforts to reduce predation on wildlife species identified as needing protection by the Idaho Department of Fish and Game (IDFG), U.S. Fish and Wildlife Service (USFWS) and other natural resources agencies. WS-Idaho would continue to provide information and training on the use of nonlethal methods including, but not limited to, herding and other livestock management and cultural practices, livestock guarding animals, exclusion, and frightening devices. WS-Idaho would also assist resource owners and managers through educational presentations on damage identification, prevention, and control, and by providing information on sources of supplies of PDM materials, such as pyrotechnics and propane cannons, or by temporarily loaning some supplies, such as live-capture cage traps. The methods which may be used by WS-Idaho would include a variety of frightening devices, ground shooting, aerial shooting, denning, various trap devices, snares, trained decoy and tracking dogs, the Livestock Protection Collar (LPC), M-44s for control of coyotes and red foxes, and DRC-1339 for control of ravens and black-billed magpies.

If a need for action is identified by the applicable wildlife or land management agency, PDM activities may be initiated for the protection of species such as the greater sage-grouse (*Centrocercus urophasianus*) (hereafter referred to as sage-grouse), mule deer and white-tailed deer (*Odocoileus*

hemionus and *O. virginianus*, respectively), bighorn sheep (*Ovis canadensis*), pronghorn antelope (*Antilocapra americana*), northern and southern Idaho ground squirrels (*Spermophilus brunneus burnneus,* and *S. b. endemicus*), and waterfowl (various species). Work Plans with federal and state land management agencies would be developed and reviewed annually to address specific activities and restrictions required to safely conduct PDM on public lands, including State Endowment lands.

The EA also considers 4 other alternatives in detail, including:

- Alternative 1 where WS-Idaho continues the current PDM program without an increase in activities to protect natural resources;
- Alternative 2 that discontinues all WS-Idaho involvement in PDM;
- Alternative 3 in which WS-Idaho is restricted to using only nonlethal PDM methods;
- Alternative 4 that requires:
    - livestock grazing permittees, landowners or resource managers to show evidence of sustained and ongoing use of nonlethal techniques aimed at preventing or reducing predation, prior to receiving assistance with lethal PDM methods from WS-Idaho;
    - employees of WS-Idaho to use or recommend appropriate nonlethal techniques in response to a confirmed damage situation prior to using lethal methods; and,
    - lethal techniques be used only when the use of appropriate husbandry or other nonlethal techniques have failed to keep livestock losses below an acceptable level as indicated by the cooperator.

The EA provides a detailed analysis of the impacts of each alternative for a range of issues identified as relevant to making selections among alternatives by the lead, cooperating, and consulting agencies and those identified during a public scoping period for the EA. Issues addressed in detail include: impact on target predator populations; non-target species including State and federally-listed Threatened or Endangered (T/E) species; impacts on Special Management Areas; humaneness and ethical perspectives; effects on recreation and aesthetics; impacts on public and pet safety; cost effectiveness; climate change; and indirect and cumulative impacts. An additional 23 issues are discussed with rationale for not addressing the issue in detail for each alternative in Section 2.3. Responses to additional issues raised during the comment period on the EA are provided in Chapter 5.

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ACRONYMS AND ABBREVIATIONS

ACEC	Areas of Critical Environmental Concern
AD	Aleutian Disease
ADC	Animal Damage Control
AFWA	Association of Fish and Wildlife Agencies
AML	Appropriate Management Level
APHIS	Animal and Plant Health Inspection Service
ATV	All-terrain Vehicle
AVMA	American Veterinary Medical Association
AWP	Annual Work Plan
BBS	Breeding Bird Survey
BDM	Bird Damage Management
BLM	Bureau of Land Management
BMP	Best Management Practices
CMNMP	Craters of the Moon National Monument and Preserve
CDC	Centers for Disease Control and Prevention
CDE	Carbon Dioxide Equivalents
CDFG	California Department of Fish and Game
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
cm	centimeters
COs	IDFG Conservation Officers
CO	Carbon Monoxide
CO2	Carbon Dioxide
CY	Calendar Year
DNA	Deoxyribonucleic Acid
DOE	Department of Energy
DPS	Distinct Population Segments
DVM	Doctor of Veterinary Medicine
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FHWA	Federal Highway Administration
FIFRA	Federal Insecticide, Fungicide and Rodenticide Act
FONSI	Finding Of No Significant Impact
FR	Federal Register
FY	Fiscal Year
GAO	General Accounting Office
GHG	Greenhouse Gas
gph	gallons per hour
GYE	Greater Yellowstone Ecosystem
ha	hectare (metric system unit of measure of area that equals about 2.47 acres)
HCNRA	Hells Canyon National Recreation Area
HMA	Herd Management Area
IDFG	Idaho Department of Fish and Game
IDL	Idaho Department of Lands

IGBC	Interagency Grizzly Bear Committee
ISADCB	Idaho State Animal Damage Control Board
ISDA	Idaho State Department of Agriculture
ISO	International Organization for Standardization
IWDM	Integrated Wildlife Damage Management
kg	kilograms
LD_{50}	Lethal Dose of 50%
LPC	Livestock Protection Collar
LRMP	Land and Resource Management Plan
LWG	Local Working Groups
MBTA	Migratory Bird Treaty Act
MFPs	Management Framework Plans (BLM)
MFWP	Montana Fish, Wildlife, and Parks
mg	milligrams
MIS	Management Information System
MNSRBPNCA	Morley Nelson Snake River Birds of Prey National Conservation Area
MOU	Memorandum/Memoranda of Understanding
mpg	miles per gallon
MT	Metric Ton
NASS	National Agricultural Statistics Service
NCA	National Conservation Area
NEPA	National Environmental Policy Act
NHPA	National Historical Preservation Act
NHSRT	National Historic, Scenic and Recreation Trails
NM	National Monument
NOx	Nitrogen Oxide
NPS	National Park Service
NRA	National Recreation Area
NWRC	National Wildlife Research Center
ODFW	Oregon Department of Fish and Wildlife
PIF	Partners in Flight
PIFSC	Partners in Flight Science Committee
PDM	Predator Damage Management
ppm	parts per million
RMP	Resource Management Plan
RNA	Research Natural Area
SNRA	Sawtooth National Recreation Area
SHPO	State Historical and Preservation Office
SMA	Special Management Area
SOP	Standard Operating Procedure
SO_X	Sulfur Oxide
T/E	Threatened or Endangered
TWS	The Wildlife Society
US	United States
USC	United States Code
USDA	United States Department of Agriculture
USDI	United States Department of the Interior
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
WA	Wilderness Area
WDM	Wildlife Damage Management

WS	Wildlife Services
WSA	Wilderness Study Area
WSRR	Wild, Scenic and Recreational Rivers

CHAPTER 1: PURPOSE OF AND NEED FOR ACTION

1.0 INTRODUCTION

Across the United States, wildlife habitat has substantially changed as human populations have expanded and land has been transformed to meet varying human needs. These human uses and needs may compete with the needs of wildlife or attract wildlife and have inherently increased the potential for conflicts between wildlife and people. This EA evaluates the potential environmental impacts of alternatives for the United States Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), Wildlife Services (WS) program involvement in predator damage management (PDM) in Idaho.

The prevention or control of wildlife damage (the goal of Wildlife Damage Management) is an essential and responsible part of wildlife management (The Wildlife Society undated). The WS[1] program is the federal agency authorized to protect American resources from damage associated with wildlife (the Act of March 2, 1931 (46 Stat. 1468; 7 U.S.C. 426-426b) as amended, and the Act of December 22, 1987 (101 Stat. 1329-331, 7 U.S.C. 426c)). Human/wildlife conflict issues are complicated by the wide range of public responses to wildlife and wildlife damage. Wildlife can have from positive to negative values depending on varying human perspectives and circumstances. Wildlife are generally regarded as providing economic, recreational, and aesthetic benefits to include the mere knowledge that wildlife exists as a positive benefit to many people. However, the activities of some wildlife may result in economic losses to agricultural resources and damage to property. Sensitivity to varying perspectives and values is required to manage the balance between human and wildlife needs. In addressing conflicts, wildlife managers must consider not only the needs of those directly affected by wildlife damage but a range of environmental, sociocultural, and economic considerations as well.

WS' activities are conducted to prevent or reduce wildlife damage to agricultural, industrial, and natural resources; property; livestock; and threats to public health and safety on private and public lands in cooperation with federal, State and local agencies, tribes, private organizations, and individuals. The WS program uses an Integrated Wildlife Damage Management (IWDM) approach (WS Directive 2.105[2]), in which a combination of methods may be recommended or used sequentially or concurrently to reduce wildlife damage. These methods may include nonlethal methods, such as cultural practices, habitat manipulation, exclusion, or behavioral modification of the offending species. Implementation of IWDM may also require the relocation or lethal control of specific offending animals or the reduction of a local population by lethal means. Program activities are not based on punishing offending animals, but are conducted to reduce damage and risks to human and livestock health and safety, and are implemented as part of the WS Decision Model process for resolving conflicts with wildlife (Slate et al.

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[1] In this analysis "WS" is used to describe the national WS program. "WS-Idaho" refers to the specific actions and responsibilities of the WS program in Idaho.

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

1992, WS Directive 2.201). Use of the WS Decision Model facilitates development of site-specific IWDM strategies for each wildlife/human conflict addressed by WS.

WS-Idaho currently implements a PDM program as developed in EAs for Northern/Central and Southern Idaho (USDA 1996 and 2002, as amended). WS-Idaho actions are authorized and coordinated through Memoranda of Understanding (MOU) with the Idaho State Animal Damage Control Board (ISADCB), Idaho Department of Lands (IDL), the USDA Forest Service (USFS), the U.S. Department of the Interior Bureau of Land Management (BLM) and the U.S. Fish and Wildlife Service (USFWS). WS-Idaho actions are also authorized and coordinated by an MOU between the ISADCB and IDFG to resolve conflicts involving animals preying on, or harassing, livestock and wildlife, damaging property or threatening human health and safety in Idaho. (See also Section 1.7.1) WS-Idaho activities are conducted in cooperation with other federal, State and local agencies, tribes and private organizations and individuals. This EA combines the analyses in the Northern/Central and Southern Idaho PDM EAs (USDA 1996 and 2002, as amended). The new analysis reviews the impacts of the existing program (environmental baseline), develops new and updated alternatives for PDM, and updates the review of potential environmental impacts of the proposed alternatives. Once completed, the final National Environmental Policy Act (NEPA) analysis and associated Decision (EA and Finding of No Significant Impact (FONSI) or Environmental Impact Statement (EIS) and Record of Decision depending on the Decision resulting from this EA) will supersede the current PDM EAs and FONSIs.

1.1 PURPOSE

The purpose of the proposed action is to reduce conflicts involving animals preying on, or harassing, livestock and wildlife, damaging other agricultural resources and property, or threatening human health and safety. Idaho predators addressed in this analysis include a range of species that prey on livestock and wildlife, damage property and other resources, and threaten human health and safety. Species involved in the majority of conflicts in Idaho are coyotes (*Canis latrans*); black bears (*Ursus americana*); grizzly bears (*U. horribilus*); bald and golden eagles (*Haliaeetus leucocephalus* and *Aquila chrysaetos*, respectively) common ravens (*Corvus corax*) (hereafter referred as to ravens); mountain lions (*Felis concolor*); red foxes (*Vulpes vulpes*); striped skunks (*Mephitis mephitis*); feral and free-ranging dogs (*C. familiaris*) (hereafter referred to as feral and free-ranging dogs); bobcats (*Lynx rufus*); raccoons (*Procyon lotor*); badgers (*Taxidea taxus*); and black-billed magpies (*Pica hudsonia*). Other predators in Idaho that have historically caused only localized damage on an occasional basis include feral and free-ranging cats (*F. domesticus*) (hereafter referred to as feral cats), mink (*Mustela vison*), long-tailed weasels (*M. frenata*), short-tailed weasels (*M. erminea*), American crows (*Corvus brachyrhynchos*), and spotted skunks (*Spilogale putorius*).

Gray wolves (*Canis lupus*) are associated with similar conflicts as those that may occur with the predator species listed above. However, it is our belief that the issues specific to wolf damage management and the recent history of the Rocky Mountain gray wolf population (e.g., extirpation, subsequent reintroduction, and recovery and the available information on the role of wolves in ecosystems) warrant detailed review in a separate analysis (USDA 2011). Similarly, although fish-eating birds (*e.g.* American white pelicans (*Pelecanus erythrorhynchos*), great blue herons (*Ardea herodias*), etc.) are also predators, the scope and nature of the conflicts associated with these species generally are confined to airports and aquaculture facilities and are sufficiently different from that of the other species analyzed in this EA that they have been addressed in a separate EA (USDA 1998, 2003, 2006).

1.2 NEED FOR ACTION

The need for action is based on requests for WS-Idaho assistance in protecting livestock, poultry, property, natural resources, and public health and safety. PDM assistance may be requested in response to threats of damage or risk to human health and safety and not just in instances when damage has already occurred. This is analogous to the general policy of public health programs to prevent adverse impacts on human health and not necessarily to wait until an illness or injury occurs. Similarly, WS-Idaho may provide technical assistance on nonlethal strategies which may be used to protect livestock from predators and prevent depredations from occurring, and there are some nonlethal methods that may be more effective if implemented prior to a predator learning to recognize livestock as a food source.

For all of its PDM activities, WS-Idaho first conducts investigation of the situation and verifies that there is a need for further action (see Section 3.2.1, WS Decision Model, step 2-"assess problem"). WS-Idaho recognizes that the majority of predators are not involved in conflicts with humans and that the mere presence of a predator does not guarantee that there is a threat of damage. Increasing numbers of people are unfamiliar with wildlife and may experience anxiety when they encounter wildlife in their proximity. In these situations, WS-Idaho personnel commonly provide technical assistance (advice, training, educational materials) to individuals and communities so they have the information needed to better understand the role and potential impacts of wildlife in their area. These consultations include advice on nonlethal strategies to prevent or reduce the likelihood of any potential future conflicts.

1.2.1 Need for Predator Damage Management for Protection of Livestock

Contribution of Livestock to the Idaho Economy. According to the National Agricultural Statistics Service (NASS), Idaho agriculture generated over $7.5 billion in annual cash receipts from farm and ranch commodities in Idaho during 2012 (NASS 2013). Of this, livestock production (primarily cattle, sheep, hogs, and poultry) and livestock products (i.e. milk, wool) accounted for nearly $4 billion, or about 53% of total farm commodity sales cash receipts and is, therefore, considered a primary agricultural industry sector in the State. Cash receipts from the sale of 1.15 million head of cattle and calves in 2012 was $1.39 billion and cash receipts from the marketing of 181,000 sheep and lambs in 2010 (this is the most current year for cash receipt data) was estimated at $22.7 million (NASS 2013). Wool sales in 2012 were $3.2 million (NASS 2013). Cattle and sheep production contributes substantially to local economies, especially rural economies. The Idaho inventory of cattle and calves, and sheep and lambs on January 1, 2013 was 2.37 million and 235,000, respectively (NASS 2013). Poultry, goats, and exotic livestock are produced in Idaho, but at lower levels. The USDA/NASS reported in their 2014 State Agriculture Overview for Idaho that 36.1% of the cattle within the State were dairy or on feed (i.e., feedlot) (NASS 2016*a*).

Predation on Livestock. Predators are responsible for the depredation of a wide variety of livestock including cattle, goats, sheep, swine, other hoofed-stock, exotic pen-raised game and poultry. Depredation is defined as the killing, harassment, or injury of livestock resulting in monetary losses to the resource. Cattle and calves are vulnerable to predation, especially at calving. Sheep, goats, and poultry are highly susceptible to year-round predation (Henne 1975, Nass 1977, 1980, Tigner and Larson 1977, O'Gara et al. 1983). Livestock losses cause economic hardships to their owners and without effective PDM to help reduce and mitigate such losses, predation and economic impacts would be higher (Nass 1977, 1980, Howard and Shaw 1978, Shaw 1987, Howard and Booth 1981, O'Gara et al. 1983). Not all producers suffer losses to predators, but for those who do, those losses can be devastating (Baker et al. 2008).

Of the predators that affect livestock, coyotes inflict the highest predation rates. In a study of sheep predation on rangelands in Utah, coyotes accounted for 67% of depredated lambs, followed by cougar predation at 31% and black bear predation at 2% (Palmer et al. 2010). Palmer et al. (2010) replicated a study from the 1970's to determine how predation rates on sheep may have changed over time. Overall, fewer lambs were lost to all causes than during the 1970's (5.8% compared with 9.5%, respectively), but the proportion of losses to predators did not change substantially. Predators were responsible for 87% of the current total lamb losses compared with 83% in the 1970s. 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 these kills were not fed upon (Nass 1977). Coyotes were also the predominant predator on sheep throughout a Wyoming study and essentially the only predator in winter (Tigner and Larson 1977).

Connolly (1992) determined that only a fraction of the total predation attributable to coyotes is reported to or confirmed by WS. WS-Idaho personnel do not attempt to locate every livestock kill reported by ranchers, but rather make attempts to verify sufficient losses to determine if a predation problem exists that requires PDM actions. Based on scientific studies and recent livestock loss surveys from NASS, WS only confirms about 19% of the total adult sheep and 23% of the lambs actually killed by predators (Connolly 1992). However, a more accurate estimation of actual statewide losses of sheep and lambs to predation is through NASS annual surveys.

Although it is impossible to accurately determine the amount of livestock PDM saves from predation, it can be estimated. Scientific studies have revealed that in areas without some level of PDM, losses of adult sheep and lambs to predators can be as high as 8.4% and 29.3% of the total number of animals in the flock (Henne 1975, Munoz 1977, O'Gara et al. 1983). Conversely, other studies have indicated that sheep and lamb losses are significantly lower where PDM is applied (Nass 1977, Tigner and Larson 1977, Howard and Shaw 1978, Shaw 1987, Howard and Booth 1981). However, there have been some studies that report that the effects of predator control activities can be short-term (Conner et al. 1998, Sacks et al. 1999). In coyotes, territorial breeding adults appear to be responsible for the majority of depredations, and actions which target the breeding pairs with territories that include the area used by livestock experiencing depredation are likely to be the most effective (Till and Knowlton 1983, Sacks et al. 1999). Not all coyotes prey on sheep, and removal of non-depredating coyotes may exacerbate predation problems by creating vacancies for new breeders that might kill sheep (Sacks et al. 1999).

Livestock producers have learned that limiting their lambing/calving period to a short period of time and congregating the birthing animals into a relatively small area reduces the extent of damage that predators such as coyotes, bobcats, and mountain lions will cause as compared to extended birthing periods spread over a wide period or area. Cattle and calves are most vulnerable to predation at calving time and less vulnerable as they get older and larger (Shaw 1977, 1981, Horstman and Gunson 1982). Because the majority of calving occurs at lower elevations in late winter and early spring, vulnerability of cattle to mountain lions, black bears, and grizzly bears is reduced. Calves remain vulnerable to these predators during the spring through autumn if they are grazed in higher elevation areas that typically represent more suitable habitats for mountain lions and bears (both black and grizzly bears). Sheep and lambs remain vulnerable to predation throughout the year, particularly from coyotes, and to mountain lions and bears (both black and grizzly bears) whenever they spend time in habitats of these species (Henne 1975, Nass 1977, 1980, Tigner and Larson 1977, O'Gara et al. 1983, Shaw 1987). Feral and free-ranging dogs are also responsible for predation on sheep and lambs throughout the year (NASS 2013). Lambs are sometimes vulnerable to red fox predation in the spring, primarily at the lower elevations.

Grouping the vulnerable animals together, both in time and space, reduces the degree of predation exposure of each individual. Unfortunately, while this practice protects the calves from predators, such as coyotes, it increases the attractiveness of the site to predators such as ravens. Ravens will attack young lambs, calves, and goats, and even adult ewes, nannies, and cattle in certain situations, by pecking the eyes and other vulnerable spots such as the anal area, nose, and navel (Larsen and Dietrich 1970, Wade and Bowns 1982). They can kill young animals by pecking out the eyes or by pecking at the umbilical cord and anus, which results in the animal going into shock and dying.

Black bears and mountain lions (Mysterud 1977, Shaw 1987) are occasionally responsible for catastrophic incidents or large losses of sheep and lambs, sometimes called “surplus killing” when only selected tissues or parts are consumed or the carcasses are not fed on at all. There have been numerous cases of surplus killings by mountain lions in Idaho. Examples of these include: on June 5, 2010, 30 sheep were reported killed by a single mountain lion in Bannock County; and on May 30, 2013 north of Gooding, Idaho, 15 sheep were killed by a single mountain lion in one incident. Mountain lions will at times commit repeated depredations on sheep over a short period of time. In April and May of 2005, 2007 and 2013, WS-Idaho reported that 107, 190 and 55 sheep, respectively, were killed by mountain lions during several depredation events over a 30 day or less period of time.

Black bears or mountain lions may also frighten an entire flock of sheep as they attack, resulting in a mass stampede. This sometimes results in many animals suffocating or being trampled to death as they pileup on top of each other in a confined area, such as along thick willow growth in the bottom of a drainage or in corrals or night pens. Since 2005, WS-Idaho has investigated 8 pile-ups, most caused by black bears, averaging 88 sheep killed per incident, with the number killed ranging from 32 to 157 sheep. Seventy-five percent (*n*=6) of "pile-ups" occurred in July with 25% occurring in August.

Scope of Statewide Livestock Losses. Nationally, 219,900 cattle/calves were lost to predation in 2010, representing a loss of $98.5 million to farmers and ranchers despite spending $188.5 million on nonlethal approaches (NASS 2011). Nationwide, multiple nonlethal predator control strategies are used by producers to protect cattle and sheep. Idaho producers' use of these strategies exceeds most of the national averages, including: for cattle, herding, night penning, fright tactics, carcass removal, culling, frequent checks, and other nonlethal strategies; and, for sheep, use of guard llamas, exclusion fencing, night penning, fright tactics, carcass removal, and shed lambing (Table 1.1). Of this national total, Idaho cattle and calf losses to predation were 1,900 and 4,200 head, respectively, with respective total value losses of $1.8 million and $1.5 million (NASS 2011). Predators responsible for adult cattle losses in Idaho included, by percentage: unknown predators (60.5%), coyotes (3.9%), other predators (3.2%), mountain lions (including bobcats and Canada lynx (*Lynx canadensis*)) (1.5%), dogs (0.5%) and bears (black and grizzly bears) (0.4%). Coyotes, unknown predators, mountain lions (including bobcats and lynx), dogs, other predators, bears (black and grizzly bears), and vultures accounted for 26.9%, 14.1%, 4.3%, 3.3%, 3%, 0.7% and 0.3%, respectively (NASS 2011) for calf losses in Idaho (Table 1.2).[3]

The most current national statistics for sheep and lamb loss to predation are from 2014 when 194,395 sheep/lambs were lost to predation, representing a loss of $32.5 million to ranchers and farmers (NASS 2015). In Idaho, predator losses accounted for 18% of all sheep losses and 37% of all lamb losses (Table 1.3), valued around $257,000 in sheep and $652,000 in lambs. Statewide, total losses to all causes were 4.1% of adult sheep and 4.9% of the lamb crop in the State. Losses were not evenly distributed among producers with 5.6% of operations reporting losses of sheep and 6.1% reporting losses of lambs to predators. Losses to other causes were reported by a higher proportion of operations with 18.9% of operations reporting sheep losses to other causes and 10.5% of operations reporting lamb losses to other causes. Other causes of death losses included age, disease, weather conditions, parasites, lambing complications, and unknown causes[4]. Coyotes were responsible for 63% and 86% of sheep and lamb losses to all predators, respectively. Wolves were the second leading cause of predator losses (208 sheep and 69 lambs)[5], followed by bears (black and grizzly bears), dogs, ravens, unknown predators, mountain lions and other predators (Table 1.3). Idaho producers also reported that 432 sheep and 439 lambs valued at $88,000 and 85,000, respectively, were injured but not killed by predators. Other potential indirect losses are weight loss to livestock due to predators chasing or scattering, and stress on livestock induced by predators.

[3] Wolves, which are addressed in a separate EA (USDA 2011), were responsible for 30% of adult cattle losses, and 47.4% of calf losses (USDA 2011).
[4] Exact cause of death was unidentifiable. May include some predator loss.
[5] Wolf damage management in Idaho is addressed in USDA (2011)

Table 1.1. Proportion of producers using specific nonlethal methods to prevent losses to cattle and calves and sheep and lambs to predators, among producers who reported using at least one nonlethal method (NASS 2011, 2015).[1]

Nonlethal Method	Protection of Cattle/Calves		Protection of Sheep/Lambs	
	Idaho[2]	U.S.	Idaho[2]	U.S.
Guard Animals	21.8	36.9	NA	NA
Guard Dog	NA	NA	37.4	40.5
Llamas	NA	NA	10.1	9.2
Donkeys	NA	NA	4.6	14.2
Exclusion Fencing	19.6	32.8	83.4	54.8
Herding	10.9	5.3	3	11
Night Penning	12.7	6.6	37.9	33.7
Fright Tactics	12.8	2.5	5.1	3.1
Carcass Removal	28.8	23.9	12.6	11.4
Culling	36.3	28.9	8.4	16.6
Shed Lambing	NA	NA	39.4	34.4
Change Bedding	NA	NA	6.6	10.8
Frequent Checks	66.4	32.1	8.9	16.4
Altered Breeding Season	NA	NA	0.8	5
Other Nonlethal	13.4	7.0	2.1	6.7

[1] Use of multiple nonlethal methods will result in percentages summing to greater than 100.

[2] Highlighted portions indicate where ID use of nonlethal strategy is above the national average.

Table 1.2. Cattle and calf losses in Idaho from predators relative to non-predator losses, including percentage (%), number (#) and value ($) of cattle and calves during 2010 (NASS 2011). Does not include losses to wolves which are addressed in a separate EA (USDA 2011).

Predator	**Cattle [1]**			**Calves[2]**		
	%	**#**	**$ [3]**	**%**	**#**	**$ [3]**
Coyotes	3.9	74	NA	26.9	1,130	NA
Mountain lions	1.5	28	NA	4.3	181	NA
Dogs	0.5	10	NA	3.3	139	NA
Bears	0.4	8	NA	0.7	29	NA
Other Predators	3.2	61	NA	3.3	139	NA
Unknown Predators	60.5	1,150	NA	14.1	592	NA
Predation Totals [4]	**4.5**	**1,900**	**$ 1,837**	**8.2**	**4,200**	**1,487**
Non-Predator Totals [4]	**95.5**	**40,100**	**$ 38,777**	**91.8**	**46,800**	**16,567**

[1] Cattle value per head is based on a two-year straight average of the value of beef cows reported in the January 1 Cattle survey from 2010 and 2011.

[2] Calf value per head is based on the market year average calf price. An average weight of 300 pounds was used in all States.

[3] Values are represented in $1,000.

[4] The % value for Predator and Non-predator Totals reflect the percent of deaths from the total of all deaths.

Table 1.3. Sheep and lamb losses in Idaho from predators relative to non-predator losses, including percentage (%), number (#) and value ($) of cattle and calves during 2001 (NASS 2011). Reports of the proportion of animals lost to specific predators are reported as % of total predator loss. This does not include losses to wolf predation. WS-Idaho actions to address predation by wolves are addressed in a separate EA (USDA 2011).

Predator	Sheep[1]			Lambs		
	%	#	$ [2]	%	#	$[2]
Coyotes	62.6	795	NA	86.2	2,891	NA
Mountain lions	*<1.6*	*<20*	NA	1.5	49	NA
Dogs	7.1	90	NA	3.1	103	NA
Bears	10.3	131	NA	1.9	65	NA
Bobcat or Lynx	<1.6	<20	NA	0	0	NA
Ravens	0	0	NA	1.8	61	NA
Other Predators	0	0	NA	0.7	24[4]	NA
Unknown Predators	<1.6	<20	NA	1.8	61	NA
Predation Totals [3]	**18.1**	**1,269**	**257**	**37.3**	**3,354**	**652**
Non-Predator Totals [3]	**81.9**	**5,731**	**1,160**	**62.7**	**5,646**	**1,098**

[1] Sheep and lamb value per head is based on values in January 2015 NASS Sheep and Goats Report.

[2] Values are represented in $1,000.

[3] The percent of deaths from the total of all deaths.

[4] Underestimate, includes take by vultures. Exact take by eagles, feral pigs, and other known predators was reported as having occurred, but all take of <20 animals was not provided by NASS to prevent disclosure of identity of survey participants.

WS-Idaho personnel record losses to predation in four general categories (confirmed, probable, probable/unknown, other). Confirmed losses are defined as those losses examined by a WS-Idaho employee during a site visit and determined to have been caused by a specific predator. Confirmation of the species that caused the loss is a vital step toward establishing the need for control and the PDM necessary to resolve the problem. The WS-Idaho employee not only confirms the predator responsible, but also records the extent of the damage when possible. Losses reported by the resource owner to WS-Idaho, but not confirmed during a site visit are recorded as reported losses. Losses caused by predators before WS-Idaho personnel are contacted for assistance and not verified are considered reported losses. Other reported losses might involve situations where the identity of the predator species could not be determined by WS-Idaho personnel. For purposes of compensation programs this last type of loss may also be classified as "unconfirmed."

During federal fiscal years[6] (FY) 2012-FY 2014 complaints of reported and verified losses from predators of all classes of livestock, including fowl (i.e., domestic chickens, turkeys, ducks and geese) and commercially raised game, reported to or verified by WS-Idaho personnel averaged about 1,050 livestock animals and about 106 fowl (Table 1.4) valued at $203,130 and

[6] The federal fiscal year is the time period from October 1, to September 30 of each year.

Table 1.4. Number of livestock and other resources reported to or verified by WS-Idaho as killed, injured, or damaged by predators in Idaho during FY 2012-FY 2014 (MIS 2012, 2013, 2014, respectively).

Species	Lambs	Sheep	Cattle	Calves	Horses and Mules[1]	Goats[1]	Alpacas and Llamas[1]	Swine[1]	Fowl[2]	Other	Bee Hives
FY 2012											
Black Bear	89	39		5		2		2			
Bobcat	3										
Coyote	338	42	12	54		3			52	4[3]	
Feral Cat[4]									9		
Feral and free-	12	34		4			1				
Grizzly Bear				8				2			21
Mtn. Lion	23	32	1	4	2	5				3[3]	
Raccoon									14		
Raven				23						1[5], 1[6]	
Red Fox									9		
Striped Skunk									2		
Sub-total FY 2012	465	147	13	98	2	10	1	4	86	7[3]	21
FY 2013											
Badger										3 Acres[7]	
Black Bear	24	21		1						3[8]	
Bobcat	6								15		
Coyote	691	60		90		3	1		17		
Feral and free-	2	4	2	8		24			14		
Grizzly Bear			7	2							
Magpie	1			8							
Mtn. Lion	213	36		2	4	9			5		
Raccoon									50		
Raven	1			2							
Red Fox	1								1		
Sub-total FY 2013	939	121	9	113	4	36	1	0	102	3 Acres[7],3[8]	0
FY 2014											
Black Bear	6	19			1						67
Coyote	905	128		55		7			69	7[3]	
Bald Eagle				1							
Feral and free-	14	5					3		14		
Grizzly Bear		2	3	5							
Mtn. Lion	8	6		3	5	6			21		
Raccoon									15	25lb. [5]	

Species	Lambs	Sheep	Cattle	Calves	Horses and Mules[1]	Goats[1]	Alpacas and Llamas[1]	Swine[1]	Fowl[2]	Other	Bee Hives
Raven	2			1							
Striped Skunk									12		
Bald Eagle				1							
Sub-total FY 2014	935	160	3	66	6	13	3	0	131	7[3], 25lb.[5]	67
Three-year Average	780	143	8	92	4	20	2	1	106	6[3] ,1Acre[7] 8lb.[5]	29

[1] Includes all age classes of animals.

[2] Includes domestic chickens, geese, ducks, turkeys, guineas and eggs.

[3] Pet dogs and cats, sporting dogs and hounds.

[4] Includes feral and free-ranging cats and feral and free-ranging dogs.

[5] Consumption and/or contamination of livestock feed. Number presented represents number of incidents.

[6] Landfills.

[7] Alfalfa hayfields.

[8] Individual fruit trees.

Table 1.5. Predator-related Damage Verified and Reported by WS-Idaho by Resource-type and Value during FY 2012-FY 2014. For cases of damage to natural resources and risks to human health and safety where economic data is not available, a description of the type of impact is provided.

Species	Number of Work Tasks[1]	Lambs	Sheep	Cattle	Calves	Other Livestock	Fowl[2]	Natural Resources[3]	Human Health and Safety[4]	Property	Other[5]
Values are in Dollars ($)											
FY 2012											
Badger	30							[6]		[7]	2,000[8,9]
Black Bear	87	14,840	5,775		3,927	640[10, 11]				1,393[12] 800[12a]	
Bobcat	243	435						[13]			
Coyote	4,661	48,735	7,100	5,400	29,677	500[10]	488	[6, 13, 14]	[15]	200[16, 17]	[18, 19]
Feral Cat	3						100				
Feral and free-	370	2,400	29,600		1,200	1,000[21]					
Grizzly Bear	72				6,283	77[11]				3,131[12]	
Magpie	4				[22]						
Mountain Lion	508	12,655	6,105	1,000	3,356	5,001[10, 23]				140[16]	
Raccoon	76						136			[7]	[19], 300[24]
Raven	85	1,600			13,800					80,000[24a]	50,000[19]
Red Fox	172	1,690					100				
Striped Skunk	48						19			[7]	[19]
Sub-total FY		82,355	48,580	6,400	58,243	7,218	843			85,664	52,300
FY 2013											
Badger	21							[6]			1,136[8, 9]
Black Bear	104	2,009	2,681		785					100[25]	26[26]
Bobcat	6	502					141				
Coyote	4,292	69,321	8,072		68,008	6,342[10, 21, 23]	423	[13, 27]	[15]	[16], 10,000[28]	[17, 18]
Bald Eagle	1	300									
Feral and free-	69	1,600	628	1,725	6,283	3,978[10]	132				
Grizzly Bear	26			8,582	1,571						
Magpie	5	84			5,997						
Mountain Lion	202	18,298	5,470		7,853	5,243[10, 23]	47		[15]		
Raccoon	46						1,220			[7], 250[29]	[24]
Raven	26	500			1,750			[14]			1,500[19]
Red Fox	20	84					25				[17]
Striped Skunk	73							[14]		[7]	[22]
Sub-total FY		92,698	16,851	10,307	92,247	15,563	1,988			10,350	2,662
FY 2014											
Badger	23							[6]			[8, 30]
Black Bear	46	503	2,426			1,500[23]				19,778[12]	
Bobcat	4	[22]			[22]						
FY 2014 cont.											

Species	Number of Work Tasks[1]	Lambs	Sheep	Cattle	Calves	Other Livestock	Fowl[2]	Natural Resources[3]	Human Health and Safety[4]	Property	Other[5]
Values are in Dollars ($)											
Coyote	3,569	77,015	14,940		40,196	7,102[10, 21]	1,483		[15]	1,451[16]	[18]
Bald Eagle	1				785						
Feral Cat	3								[15]	[7]	
Feral and free-	46	1,172	638	22	17,505 21		349			16	
Grizzly Bear	53	[22]	255	3,678	3,927						
Magpie	23				[22]						
Mountain Lion	75	670	1,138		2,356	2,084 [10, 23]	1,037		[15]		
Raccoon	56						374			[7]	[19]
Raven	52	251			785					[7]	[19]
Red Fox	5	[22]					[22]		[15]		
Striped Skunk	97						274		[15]	[7]	[19]
Sub-total FY		79,611	19,397	3,678	65,554	10,686	3,517			21,229	0
Three-year Average		**84,888**	**28,276**	**6,795**	**72,015**	**11,156**	**2,116**			**39,081**	**18,321**

1 A Work Task is defined as a single visit to a property or contact by WS-Idaho personnel to provide technical assistance, to conduct a wildlife damage field evaluation/assessment/investigation, or where a PDM activity/project is in progress. The number of work tasks serves as an index of the intensity of effort needed by WS personnel to address incidents involving the species in question.

2 Includes domestic chickens, geese, ducks, turkeys and eggs.

3 Damage assessment values on threats of predation and the value of T/E species are difficult to quantify and may be incalculable).

4 Damage assessment for wildlife threats to people, human safety, aviation safety, and threats from potential disease transmission are difficult to quantify.

5 Monetary damage assessment may not be reported or estimated for all of these resources.

6 Predation on Northern Idaho ground squirrels, a T/E species.

7 Damage to residential and non-residential buildings.

8 Damage to alfalfa hayfields.

9 Damage to range or pastures.

10 Predation on or threats to goats (all age classes).

11 Predation on domestic swine.

12 Damage to bee hives.

12a General property.

13 Predation or threats to mule deer.

14 Predation or threats to wild upland game birds.

15 Direct threats to humans.

16 Predation on pet dogs and cats, sporting dogs and hounds.

17 Damage or threats of damage to livestock guarding animals.

18 Predation on commercial game birds.

19 Contaminating or consuming livestock feed.

20 Includes feral and free-ranging dogs.

21 Predation on or threats to alpacas and llamas (all age classes).

22 Harassing or chasing.

23 Predation on or threats to horses and mules (all age classes).

24 Damage to field corn.

24a Damage to landfills.

25 Damage to fruit trees.

26 Consuming or contaminating human and non-human food items.

27 Predation on other wildlife.

28 Damage to irrigation drip lines.

29 Predation on or damage to aquaculture and/or ornamental fish.

30 Damage to dikes, dams or impoundments.

$2,116, respectively, per year (Table 1.5). Of these losses, lamb losses per year averaged $84,888, while sheep losses averaged approximately $28,276 per year (Table 1.5). Of these losses, coyotes accounted for approximately 83%, mountain lions 9%, black bears 5%, and feral and free-ranging dogs 3% of the depredations on individual livestock (Table 1.4). In regards to monetary losses, coyotes (excluding wolves) caused the most economic damage on livestock. The 3-year annual average (FY 2012-FY 2014) of reported/verified damage by predator species was coyotes ($133,341), mountain lions ($24,151), feral and free-ranging dogs ($22,649) and black bears ($18,597) (Table 1.6). All the other predators covered by this EA (bobcats, grizzly bears, magpies, raccoons, ravens, red foxes and stripped skunks) have been known to kill or injure livestock and/or poultry (Table 1.4). Problems caused by badgers have been primarily isolated to pasture, rangelands damage and predation on northern Idaho ground squirrels (Tables1.4 and 1.5).

In addition to direct livestock losses to predators such as predation and injury, producers also lose livestock indirectly to predators. For example, a potential indirect loss to cattle producers is disease transmission from predators; cattle can become infected with rabies after being bitten by infected animals, such as skunks and fox. Indirect losses are typically minor, but the potential losses can be devastating should a major outbreak occur.

Table 1.6. Estimated Value in Dollars of Damage that was Verified and/or Reported to WS-Idaho by Predator Species in FY 2012-FY 2014.

Species	FY			
	2012	2013	2014	3-Year Annual Average[1]
Badger	$0	$0	$0	$0
Black Bear	25,982	5,601	24,207	18,597
Bobcat	435	643	0	359
Coyote	92,100	162,166	145,756	133,341
Eagle[2]	0	300	785	362
Feral Cat[3]	100	0	0	33
Feral and free-ranging	34,200	14,082	19,664	22,649
Grizzly Bear	9,491	10,153	7,860	9,168
Magpie	0	6,081	0	2,027
Mountain Lion	28,257	36,911	7,285	24,151
Raccoon	136	1,470	374	660
Raven	145,400	3,750	1,036	50,062
Red fox	1,790	109	0	633
Striped Skunk	19	0	274	98
Total	$337,910	$241,266	$207,241	$262,139

[1] Rounded-off to the nearest whole number.

[2] Bald and golden eagles.

[3] Includes feral and free-ranging domestic cats.

[4] Includes feral and free-ranging dogs.

1.2.2 Need for Predator Damage Management for Protection of Property, Crops and Other Agricultural Resources

Property. WS-Idaho also responds to requests from livestock grazing permittees, landowners and IDFG to alleviate property damage from predators, such as: black bears and raccoons breaking in and destroying the interiors of homes or other structures; coyotes, mountain lions, grizzly bears or red foxes killing pets and livestock guarding animals; ravens pecking holes in waterproof tarps at landfills; raccoons and skunks burrowing into or under homes to den; and badgers, skunks, or raccoons causing damage to landscaping, gardens or golf courses from their feeding activities.

Considering FY 2012, FY 2013 and FY 2014, an average of 142 incidents (work tasks[7]) (MIS 2014) per year of predator damage to property was reported to or verified by WS-Idaho with an annual average loss per year of $39,081 (Table 3). Striped skunks accounted for 32% of the incidents; coyotes 30%; red foxes at 12%; raccoons 10%; black bears 5%; mountain lions and badgers 3% each; and bobcats, ravens, feral cats, minks, feral and free-ranging dogs and grizzly bears responsible for the remaining 5% (MIS 2014). The highest value of a single damage incident was from raven damage to landfill tarps at $80,000 (Table 3). Another example of a high value single damage incident was from coyote predation on pet dogs and cats, sporting dogs and hounds, at $1,451. An average of 7 pets are killed or injured per year during FY 2012-FY 2014 by coyotes (65%), mountain lions (20%) and bobcats (15%) with a total annual average value of $655 (Table 3) (MIS 2014).

Crops. Field crops, such as melons (watermelons and cantaloupes), sweet and field corn and wheat, are susceptible to damage by predators, such as coyotes, feral and free-ranging dogs, badgers and raccoons. Fruit and nut crops and trees can also be damaged by raccoons, ravens and black bears in Idaho. Another type of problem is improved or planted pasture damage caused by badgers burrowing because the burrows and uneven ground left by digging can hamper the use of planting and mowing equipment and can result in damage to the equipment. During FY 2012-FY 2014, badgers and raccoons were the only predator that accounted for crop/pasture damage (monetary assessments were not provided for this damage); whereas, black bears were the only predator that reportedly damaged fruits and fruit trees ($100) (Table 3) (MIS 2014).

Other Agriculture Resources. Several other commodities associated with agriculture can be damaged by predators. Damage to these resources in FY 2012-FY 2014 included: $24,302 to bee hives by black bears and grizzly bears; $51,500 damage from badgers, coyotes, raccoons, ravens and striped skunks contaminating and/or consuming livestock feed and damage to dikes, dams or impoundments; $250 damage from raccoons to aquaculture; and $10,000 damage to irrigation drip lines from coyotes.

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[7] A work task is defined as a single visit to a property or contact by WS-Idaho personnel: 1) to provide technical assistance, 2) to conduct a field wildlife damage evaluation/assessment/investigation, or 3) where a PDM activity/project is in progress.

1.2.3 Need for Predator Damage Management for the Protection of Natural Resources

Predation is a natural and important part of healthy ecosystems. However, changes in environmental conditions, often associated with human activity (e.g., habitat loss, fragmentation or alternation, introduction of invasive species), or a combination of human-induced changes and natural factors may disrupt the relationships between predator and prey and result in situations where predation may be limiting or threatening the long term viability of a prey species (Diamond 1992, Newsome et al. 2015). Agricultural development, landscape fragmentation, and encroaching human populations may increase the diversity and density of predators (Summers et al. 2004, Coates and Delehanty 2010, Dinkins et al. 2014). In these situation, agencies with regulatory responsibility for maintaining wildlife populations may consider PDM as one of several tools to help restore sensitive species or enhance prey populations to meet game management objectives. Limited information suggests that predator management may provide short-term relief for a population sink (Hagen 2011).

Human activities including development, trash disposal, and crop and livestock production can provide food and habitat subsidies that insulate predator populations from the effects of prey decline and result in sustained increases in predator densities above that which would otherwise be supported by the system (Newsome et al. 2015). When this occurs, natural prey populations may not have the relief from predation and opportunity to recover that would normally occur in predator prey cycles. Alternatively, predators may decrease use of natural prey sources when artificial subsidies are present which may reduce top-down pressure on prey populations and adversely impact interactions among trophic levels in the food web and density-based interactions among prey species. Artificial elevations in predator populations can also impact interactions among predator populations and associated ecosystem-level impacts (Newsome et al. 2015). In general, the preferred response is to address the source of the subsidy, however, land management agencies may elect to supplement efforts with temporary localized management of predator populations.

In Idaho, it is the responsibility of the applicable State, federal and/or tribal agency(ies) with regulatory authority for maintaining sustainable native wildlife populations in accordance with established management objectives to determine when and where PDM may be appropriate. Sage-grouse, bighorn sheep, mule deer and other state-designated game species populations in some sections of Idaho are sufficiently healthy that IDFG allows sport harvest of these species. However, in other sections of the State, IDFG has not met management goals for these populations and may consider PDM in addition to other activities in an effort to enhance local populations of these species. PDM, when implemented, targets the specific areas where predation has been identified as a potentially limiting factor and is not used at broad geographic or temporal scales. Depending on the legal status of the predator, concurrence with the need for action and applicable authorization for PDM actions must be provided by the agency with regulatory authority for the predator species. In some cases, as in the case of a resident predator preying on a resident prey species (e.g., mountain lion predation on mule deer), this is the same agency. In other cases, the predator species may be managed by the State but another entity has primary responsibility for the prey (e.g., badger predation on federally-listed threatened northern Idaho ground squirrels) or vice versa (e.g., raven predation on sage-grouse).

Interactions between predators and prey are complex and depend on a wide range of factors such as habitat quality, density of prey relative to carrying capacity of the environment, availability of alternate predators and prey, environmental conditions, life history of the species involved and interactions with other species in the ecosystem (Gese and Knowlton 2001, Krebs et al. 2001, Hagen 2011). The role of predators in the population dynamics of prey species has been investigated for decades but, due to the complexity of these relationships and the fact that relationships between predators and prey may be dependent on site- and species-specific conditions, it is difficult to accurately determine the magnitude of the role of predation in prey species dynamics. Other factors that may confound efficacy of predator removal projects for prey population enhancement may include, but are not limited to, rapid recolonization of project areas by predators from surrounding sites, increases in populations of mesopredators that had previously been suppressed by the target predator population which has the potential to make the problem worse or generate new problems, and behavioral adjustments (e.g., increase in territory size, prey switching) by other predators in the system (Crooks and Soulé 1999, Prugh et al. 2009, Levi and Wilmers 2012, Miller et al. 2012). Smith et al. (2010) conducted a review of studies involving predator removal to enhance bird populations. Based on their review, they concluded that predator removal could increase breeding population numbers and improve hatching and fledging success, with an increase of 71% in breeding populations in predator-removal areas. In general projects that targeted all predators tended to be more effective than projects targeting a subset, potentially because it reduced the risk of problems with mesopredator release and compensatory predation. Benefits were not greater for projects to protect ground-nesting birds than projects to protect other bird species. Although the study did not provide evidence that predator removal could enhance post-breeding populations overall, which might be an indication that other factors than nesting success were also limiting bird populations, but there was evidence that at least in some circumstances it could have beneficial impacts. Evidence was available indicating that predator removal helped post-breeding bird populations on mainlands but not on islands. The authors did note that predator removal on mainlands needed to be an ongoing strategy unless other factors contributing to predation problems are addressed. The authors noted that there was considerable variation in impacts on post-breeding populations, and analysis the authors had an insufficient number of samples to detect a difference for some circumstances given the variation in responses.

Predation may work in combination with other factors, such as habitat quality. For example, predation may only be a limiting factor for the population if habitat is poor (e.g., Bui 2009). Under these conditions the best long-term strategy may be to improve habitat instead of conducting PDM or only conduct PDM until such time as habitat quality has improved and predation is no longer a limiting factor. Successful PDM programs for the enhancement of wildlife populations also requires a thorough understanding of the limiting factors for the population. Projects to enhance bird populations by increasing nesting success have achieved short-term goals to enhance fall bird populations, but failed to increase the number of breeding birds because of population constraints that are not related to the breeding season (e.g., predation in winter).

Agency determinations to try PDM as an aid to other management strategies are based on a number of factors including project-specific data collected by the agency and scientific literature. Research to precisely define all factors needed to fully understand site-specific predator/prey systems is often expensive, complex, and may take years to complete. Natural resource management agencies must balance the need to act to enhance or protect sensitive wildlife populations promptly with gaps in knowledge of the precise factors impacting local wildlife populations and understanding of the potential environmental consequences of management actions. Consequently, natural resource management agencies often implement adaptive management approaches that include work to address multiple factors that may be impacting the population, monitoring of project impacts, and adjustment of management actions over time to best achieve management objectives. This enables the natural resource management agency to realize any potential benefits of management actions while concurrently obtaining information needed to make improved management decisions. Natural resource management agencies understand that predator-prey relationships are complex, and not all predator removal projects are successful. Consequently, agencies may test PDM projects on relatively small areas and for limited periods of time before committing long-term resources to PDM projects. For example, from 1997-2002 WS-Idaho assisted IDFG with a coyote and mountain lion population reduction effort that was conducted in select game management units in southeastern Idaho for mule deer population enhancement (Hurley et al. 2011). The project failed to result in sufficient improvement in mule deer populations to warrant continuation and it was subsequently discontinued. Based on information from Hurley et al. 2011 and published studies (see section on mule and white-tailed deer below), coyote removals for deer population enhancement are not anticipated. The IDFG has initiated a project to evaluate the effectiveness of raven removal to enhance sage-grouse populations (IDFG 2013*a*). To date, WS-Idaho has not provided operational assistance with this project. The project would only be conducted in 3 of the 15 sage-grouse management zones in the State, and would only include a portion of the area within the zone - specifically areas that had exhibited sharp sage-grouse declines relative to the statewide trend. If a natural resource management agency requests assistance in protecting wildlife species, WS-Idaho works with the agency to identify and provide the level of assistance requested and needed.

Predator management for the protection or enhancement of a prey species is also one of the most contentious types of PDM actions. Management agencies considering this type of PDM action must consider and balance a highly diverse range of values, ethics, and concerns. Public concerns include concerns regarding favoring the wellbeing of one species over that of another; the morality of killing a predator so that more game animals may be available to hunters; concerns about letting a species that is abundant because it can thrive in human-altered landscapes adversely impact a T/E species; the desire to maintain hunting opportunities and associated traditions and cultural values; and the appropriateness of using an agency to remove predators that could be taken by hunters and trappers. Members of Native American tribes have unique spiritual relationships with specific wildlife species and ecosystems as a whole and question the appropriateness of killing one species to benefit another, especially when there are usually larger underlying habitat issues impacting the prey population.

PDM programs can be expensive to implement and population factors including compensatory birth and death rates, and immigration from surrounding areas may necessitate long-term commitments to PDM unless underlying long-term factors impacting the population (usually habitat quantity and quality) are addressed. Consequently, PDM is not used as a stand-alone solution for enhancing the success of other wildlife species, but is used when the management agency has determined that predation is having a negative impact on recruitment (i.e., survivorship of newborn animals to adulthood) or is a limiting factor in the success of the wildlife species of concern even while other factors are being addressed. While outside of the scope of authority and decision-making for WS-Idaho, it is important to note that PDM actions are generally only requested as a supplement to other management actions, and that there are other related and ongoing activities to enhance game species survival and success. Activities, such as habitat restoration and improvements, eliminating habitat and food subsidies that are supporting high populations of ravens or disease management, are implemented by the appropriate land management agencies (e.g. USFS or BLM), in coordination with IDFG. For example, removal of juniper trees from lek and nesting areas is just one of many habitat restorations and improvements that may be implemented in addition to PDM for sage-grouse. Conover and Roberts (2016) note that sage-grouse now face a world where the sagebrush ecosystem is shrinking and some predator populations are increasing. PDM is a single cog in the greater effort to support the sage-grouse recovery efforts of many state, federal and other associations. More information on sage-grouse management can be found in the Conservation Plan for the Greater Sage-grouse in Idaho (Idaho Sage-grouse Advisory Committee 2006) and the Idaho and Southwestern Montana Greater Sage-Grouse Proposed Land Use Plan Amendment and Final Environmental Impact Statement (BLM 2015).

WS-Idaho involvement in these types of projects has been very limited. For approximately 5 years starting in the late 1990's, IDFG provided funding and direction for WS-Idaho to conduct coyote predation management for the protection of mule deer. WS-Idaho has been in ongoing discussions with the IDFG to conduct skunk, raccoon, red fox and coyote predation management to protect nesting waterfowl (ducks), although these projects have never been formalized or implemented. In FY02, a project to test mammalian predator removal for the protection of sage grouse was proposed by IDFG (USDA 2002a), but was not implemented by WS-Idaho. Additionally, IDFG requested WS-Idaho assistance with a brief project in 2004 to conduct selective mountain lion predation management to protect bighorn sheep in areas where they had been reintroduced. More recently in FY13, WS-Idaho received a request to assist in an IDFG research project evaluating raven removal as a strategy to help enhance sage-grouse population recovery efforts that is currently being implemented by IDFG (IDFG 2013*a*). And during the past 10 years, the USFWS and WS-Idaho have entered into interagency agreements for badger, red fox and coyote predation management for the protection of federally-listed threatened, northern Idaho ground squirrels (see below). At present, WS-Idaho is only involved in the northern Idaho ground squirrel protection project. WS-Idaho is considering providing requested assistance to IDFG with the project to manage raven predation on sage grouse, but WS-Idaho involvement is only possible if Alternative 5 is selected. The following discussion presents information on different types of situations wherein WS-Idaho PDM assistance for the protection of natural resources may be requested. The discussion is not a commitment to conduct PDM for the protection of natural resources at this time. Instead, this discussion provides limits on the types of PDM requests that WS-Idaho could respond to within the context of this EA.

Sage-grouse. WS-Idaho anticipates receiving requests to provide predation management in a limited number of sage-grouse nesting areas to protect eggs and chicks during the vulnerable nesting and fledging periods (IDFG 2013*a*). Nest predation and early brood (chick) mortality by predators has been well documented in the literature (Schroeder et al. 1999, Connelly et al. 2000, Schroeder and Baydack 2001, Coates 2007).

Sage-grouse populations have declined throughout southern Idaho and much of the western U.S. over the last several decades due to a variety of environmental factors (Connelly and Braun 1997, Connelly et al. 2004, Knick and Connelly 2011). Factors that contribute to declining numbers of sage-grouse include a reduction in the quality or quantity of sagebrush habitat, drought, fire, disease and predation (Conover and Roberts 2016). Sage-grouse populations occupying habitats that are highly fragmented or in poor ecological condition may exhibit relatively low nest success, low juvenile recruitment and poor adult survival that may be related to increased predation (Gregg 1991). Populations of some of the most important prairie grouse[8] predators have increased dramatically over the last 100 years (see analysis related to coyote, red fox and raven populations in Chapter 4) and even in areas of good habitat, predator populations can be so abundant that habitat alone may not suffice to allow grouse populations to increase (Bergerud 1988b). Schroeder and Baydack (2001) suggested that as habitats become more fragmented and populations of prairie grouse become more threatened, it becomes more important to consider predator control as a potential management tool. Because damaged sagebrush habitats may take 15-30 years or longer to recover, a predator management strategy that effectively increases nest success and juvenile survival may be useful in offsetting some of the negative effects of poor habitat. Similarly, efforts to reduce human-generated habitat and food subsidies that support artificially high predator (e.g., raven) populations may provide long-term relief from predation that is preferable to sustained raven population reduction. However, in some situations there are limits to the extent to which the public or landowners are willing to sufficiently self-restrict their activities that may generate these subsidies. This approach might also allow a more rapid recovery of grouse populations following habitat recovery.

In 2010, the USFWS determined that listing the greater sage-grouse as a T/E species under the Endangered Species Act (ESA) was warranted, but precluded by higher

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[8] Grouse fall within two general categories, forest and prairie grouse. In Idaho, the prairie grouse group includes sage and Columbian sharp-tailed grouse.

priority listing actions. In a 2015 status review, the USFWS determined that sage-grouse remained relatively abundant and well-distributed across its range and do not face the risk of extinction now or in the foreseeable future. The USFWS decision was based on the existing effective conservation efforts implemented since 2010 and commitments to future conservation efforts. In reaching listing decisions, the USFWS examined the best available data in relation to five potentially limiting factors for wildlife populations. These were:

- Factor A. Present or threatened destruction, modification, or curtailment of the species habitat or range.
- Factor B. Overutilization for commercial, recreational, scientific or education purposes.
- Factor C. Disease or predation.
- Factor D. Inadequacy of existing regulatory mechanisms.
- Factor E. Other natural or manmade factors.

In the USFWS 2010 determination that listing was warranted but precluded by other listing priorities, the USFWS concluded that Factors A and D were significant threats to greater sage-grouse. Habitat disturbance, loss and fragmentation remain the primary concerns for the decline in sage-grouse populations range-wide. This determination was re-affirmed in the subsequent USFWS determination to not list sage-grouse (USFWS 2015). However, the USFWS also concluded that landscape fragmentation is likely contributing to increased predation on sage-grouse. The USFWS found no evidence to suggest that predation is limiting sage-grouse populations range-wide; but, in localized areas where habitat is compromised by human activities, predator dynamics have shifted and predation could be limiting local sage-grouse populations (Baxter et al. 2007, Coates 2007, Bui 2009, Coates and Delehanty 2010, Lockyer et al. 2013). The USFWS (2015) noted that mortality due to nest predation by ravens or other human-subsidized predators has, at times, caused local population declines, and in extreme cases, local extirpations. Mammalian predators and ravens are suspected of causing local sage-grouse population declines and extirpation in Washington (Schroeder et al. 2014). Raven abundance was also strongly associated with sage-grouse nest failure in Nevada, resulting in negative effects on sage-grouse reproduction (Coates 2007, Lockyer et al. 2013).

Degraded and fragmented landscapes can benefit predators by increasing their kill efficiency, as well as increasing available food, nest or den substrates (Schroeder and Baydack 2001, Connelly et al. 2004, Coates 2007, Hagen 2011). Raven abundance has increased substantially in some areas of western North America since the 1960s (Coates and Delehanty 2010, Sauer et al. 2014, Coates et al. 2016). Several studies have documented negative effects to sage-grouse associated with increased corvid[9] populations (Holloran 2005, Coates 2007, Conover et al. 2010, Lockyer et al. 2013, Coates et al. 2014, Howe et al. 2014). Coates (2007) documented raven and badger

[9] Corvids are a group of birds that include ravens, crows, magpies (*Pica* spp.), and jays.

predation on sage-grouse nests using videography and reported that changes in habitat can influence predation rates by influencing predator composition and abundance, as well as the ability of predators to locate nests. Coates et al. (2016) observed that ravens selected areas near sage-grouse nests which supports the findings of studies by Coats et al. (2008) and Lockyer et al. (2013) indicating that ravens actively hunt sage-grouse eggs and chicks. Habitat fragmentation in sage-grouse nesting areas can result in birds nesting in areas of reduced concealment and, seemingly increase probability of detection by visually-cued predators such as ravens. Habitat loss may concentrate nesting females into smaller areas that are more easily searched by predators.

Studies on increasing raven populations have also been recently conducted in Idaho (Coates et al. 2014, Howe et al. 2014) and central Utah (Conover et al. 2010). Man-made features such as utility poles and structures, livestock water supplies, travel lanes and dens may facilitate colonization of new areas by predators and/or support higher populations of predators than could be sustained by native ecosystems (Schroeder and Baydack 2001, Connelly et al. 2004, Idaho Sage-grouse Advisory Committee 2006, Coates 2007, Bui et al. 2010). Research in western Wyoming attributed increased sage-grouse nest depredation to high corvid abundances, which resulted from anthropogenic food and perching subsidies in areas of natural gas development (Holloran 2005). In the same Wyoming location, Bui (2009) found raven abundance increased in association with oil and gas development. In Nevada, human-made structures in the environment were shown to increase the effect of raven predation, particularly in low canopy cover areas, by providing ravens with perches (Coates 2007). Coates et al. (2016) documented that raven occurrence increased 45.8% in areas where livestock were present. Ravens also selected areas near sage-grouse leks. However, Coates et al. (2016) did not detect an association between livestock use and distance to lek and raven selection of areas near sage-grouse leks and near cattle appeared to occur independently. Habitat management practices that improve the amount and quality of sage-grouse habitat and that minimize human-generated attractants for predators are likely to help reduce predation on sage-grouse eggs and chicks.

High predator abundance within a sage-grouse nesting area may negatively affect sage-grouse productivity without causing direct mortality. The increase in the numbers of corvids within the sagebrush ecosystem is an important change because sage-grouse nests are at greater risk of predation by these visual predators (Conover et al. 2010). Even low but consistent raven presence can influence sage-grouse reproductive behavior (Bui 2009, Dinkins et al. 2012). Sage-grouse females tend to select nest and brood-rearing locations that are farther away from predator perches and have lower densities of avian predators (Dinkins et al. 2012, Dinkins et al. 2014). When nesting in areas with relatively higher abundances of ravens, females reduce the amount of time they spend off their nests, potentially compromising their ability to secure sufficient nutrition to complete the incubation period (Coates and Delehanty 2008).

Sage-grouse in Idaho: Because of a decline in greater sage-grouse populations and habitat losses range-wide, Idaho, like most western States, has engaged in a conservation planning process to maintain, enhance and restore sage-grouse and balance sage-grouse habitats and populations. This Conservation Plan details specific projects that have been completed or are in progress to remedy the identified limitations. While habitat improvements and fire management are outside of the scope of analysis of this EA, these important efforts are mentioned to show how other efforts that provide long term benefits to sage-grouse populations are a high priority for multiple land management agencies. The Conservation Plan for the Greater Sage-grouse in Idaho identified nineteen threats to sage-grouse. The top-five threats were: wildfire; infrastructure; annual grasslands; livestock impacts [improper grazing practices]; and human disturbance (Idaho Sage-grouse Advisory Committee 2006).

The Conservation Plan lists predation among many other factors affecting sage-grouse. Similar to the USFWS determination, the Idaho sage-grouse science panel did not rank predation as a priority threat to sage-grouse statewide, but did recognize that predation may be a greater concern in local areas with limited or poor-quality habitat (Idaho Sage-grouse Advisory Committee 2006). Management that protects remaining large, robust, undeveloped stands of sagebrush shrub and herbaceous plant communities is central to stabilizing sage-grouse populations faced with growing predation threats (Coates and Delehanty 2010). The responsibility to implement these practices is born with private landowners and private, State and federal landowners and managers and is outside the scope of authority of the WS program.

Despite significant ongoing habitat conservation and restoration efforts by 12 Idaho sage- grouse Local Working Groups (LWG), losses of sage-grouse habitat to wildfire and annual grasslands increase annually (Idaho Sage-grouse Advisory Committee Technical Assistance Team 2013). High quality sage-grouse habitat takes time to develop, even in areas that are not disturbed by factors, such as wildfire. Nonlethal methods of raven control are also beginning to be implemented in Idaho, but, like habitat restoration, some nonlethal methods may take several years to result in a reduction in raven numbers. Long-term, nonlethal measures to limit raven numbers that may be implemented by the IDFG and local sage-grouse working groups include but are not limited to:

- Working with power companies to identify and retrofit towers, transformer boxes and pump banks to discourage raven nesting;
- Working with power companies to install towers that are unsuitable to nesting ravens, when those towers are due for re-builds and when transmission lines are being developed;
- Working with power companies to remove raven nests on transmission lines during the non-breeding season;
- Working with private landowners and land management agencies to retrofit buildings, water towers, or other structures to discourage raven nesting;

- Encouraging private landowners and land management agencies to remove unused or non-functioning structures that may support raven nests;
- Working with private landowners and land management agencies to prioritize and implement juniper (*Juniperus* spp.) removal projects;
- Educating livestock owners about carcass management;
- Educating livestock owners to clean livestock birthing grounds;
- Working with the Idaho Transportation Department to quickly remove road-killed animals; and,
- Working with local landfills to quickly cover animal carcasses and to implement operations that reduce raven scavenging.

Damaged sagebrush habitats may take 15 to 30 years, or longer to recover, and a predator management strategy that effectively increases nest success and juvenile survival may be useful in offsetting some of the negative effects of poor habitat during the time it takes for habitat restoration efforts to take effect. The State Plan outlines a framework for determining when predation may be an issue in a local area or for a specific population of sage-grouse, and allows for predator control as a supplement to habitat improvements and other nonlethal raven management measures when justified. The IDFG (IDFG 2013a) proposed implementing a predation management project to evaluate the impacts of efforts to protect sage-grouse during more vulnerable strutting, nesting and early brood periods, on a short term basis, and in conjunction with habitat improvement projects.

The USFWS (2015) noted that measures to remove predator perches or subsidized food sources could minimize adverse effects of predation, but that the efficacy of predator removal programs has not been clearly established and is limited by the fact that predator populations quickly rebound without continual control (Coates 2007, Hagen 2011). Hagen (2011) also noted that data necessary to fully understand the role of predator management in sage-grouse enhancement are limited and usually lack sufficient information to fully assess the relationship between PDM and habitat factors (See also Section 2.3.20). Because of the challenges with predator population rebounds after removals, some authors have suggested aversive conditioning of breeding pairs instead of or as a supplement to removals (Bui et al. 2010).

A report by Robinson and Messmer (2013) illustrates the complications that can occur in studies assessing habitat and PDM. Robinson and Messmer (2013) noted that sage-grouse nest and brood success rates were higher in the treatment area where raven removals were conducted, which might indicate that corvid removal had a limited benefit to nest and brood success. However, adult hen survival and chick survival to fledging were higher in the area without raven removal. Interpretation of the results was confounded by several factors including lack of information on hen and chick survival in the two areas, prior raven removals at one of the two sites (the differences may have been pre-existing conditions), and differences in the apparent abundance of red foxes between the two areas. Red foxes, which can prey on sage-grouse hens and young, were observed in the area where DRC-1339 was used but no red foxes were observed in the area where DRC-1339 was not used. Results were also complicated by the low number of sage-grouse hens and nests for study at the site where the raven removal was conducted which complicated statistical comparisons between the sites. Nonetheless, despite the complexity in issues impacting sage grouse, there is evidence that PDM can benefit sage-grouse populations.

Batterson and Morse (1948) documented heavy predation on sage-grouse nests in northeastern Oregon and concluded that the greatest single limiting factor for sage-grouse populations was nest predation by ravens. Magpies, crows, coyotes and badgers were also documented as nest predators, but were generally of much less importance than ravens. The authors initiated a raven control program and subsequently documented a 51% nesting success rate in their treatment area versus a 6% nesting success rate in an area where no ravens were removed. The authors also believed that raven predation on chicks up to ten days old accounted for the greatest predatory loss of chicks in their study areas. They considered raven control an essential element of sage-grouse management. The study did not collect or compare habitat characteristics between treated and untreated sites. (Hagen 2011)

Keister and Willis (1986) suggested that the major factor in determining sage-grouse population levels in their study area in southeastern Oregon was loss of nests and chicks during the first 3 weeks after hatching. Coyotes and ravens were suspected as the primary nest predators. A coyote removal project was implemented on their study area, and sage-grouse productivity increased dramatically from 0.13 chicks/hen to 2.45 chicks/hen in just 3 years. Willis et al. (1993) analyzed data on sage-grouse and predator populations, weather and habitat from an area of Oregon that had some of the best sage-grouse habitat in the State. The only meaningful relationship they found was a significant negative correlation between coyote abundance and the number of sage-grouse chicks produced per hen. They concluded that fluctuation in predator abundance was probably the single most important factor affecting annual productivity of sage-grouse in their study area.

In Idaho, low chick survival during the first 2-3 weeks after hatching has also been identified as a potentially limiting factor. Burkepile et al. (2001) radio-marked 31 chicks from 13 broods in 1999 and 44 chicks from 15 broods in 2000. Survival estimates for 1999 and 2000 were only 15% and 18%, respectively. Predators were responsible for 90% of the mortality in 1999 and 100% of the mortality in 2000 with chicks taken by avian and mammalian predators as well. However, Burkepile et al. (2001) because of the localized nature of the study, results may not be applicable to very large landscapes. Bunnell and Flinders (1999) also documented significant predation by red fox on sage-grouse in their study area in Utah, and revised sage-grouse management guidelines (Connelly et al. 2000) suggest that red fox populations should be discouraged in sage-grouse habitats. To the extent that red fox, coyotes, ravens and other predators which prey on chicks are also preying on eggs, reducing the populations of these predators from sage-grouse nesting and early brood-rearing areas has the potential to benefit both nesting success and chick survival. Baxter et al.

(2007) documented an increase in adult sage-grouse survival in areas of Utah where year-round red fox removal was conducted. Unfortunately, the study did not include evaluation of a no-treatment area and occurred during a period when sage-grouse population trends were generally increasing, so the results of the study may be confounded by other factors (Hagen 2011).

Coates and Delehanty (2004) documented a 73.6% sage-grouse nest success over 2 years in an area with raven removal, compared to the average 42.6% reported in the literature. The authors of the study did not identify the quality of the area as good or poor sage-grouse habitat. In a review of raven population densities and resource selection of ravens in Curlew Valley, prepared by Coates et al. (2013), the authors reported raven densities in the area of 0.7 ravens/km^2, a level which "far exceeds the density believed to have significant impacts on sage-grouse populations." The conclusion was based on extrapolation from a study conducted in northeastern Nevada by Coates (2007). Coates (2007) compared 63 predictive models of sage-grouse nest success with varying combinations of variables including age of grouse, raven abundance and microhabitat characteristics. Nest success was best described by a model using age of grouse and raven abundance with age of grouse as the most important factor. In their study, the inflection point of a logistic curve showing the relationship between the probability of nest predation and raven abundance was 7.3 ravens per a 10 km survey transect. The inflection point marks the point at which rate of nest success drops below 50%. Extrapolating data from the survey out to a larger area yields an estimate of 0.46 ravens per km^2.

Columbian Sharp-tailed Grouse. The Columbian sharp-tailed grouse is one of six subspecies of sharp-tailed grouse in North America. They were once considered the most abundant and well-known upland game birds in the Pacific Northwest. Historically, Columbian sharp-tailed grouse occurred within sagebrush-native bunch grass habitat throughout the intermountain region, extending from British Columbia, Washington State, Idaho, and Montana south through portions of Oregon, California, Nevada, Utah, Wyoming, Colorado and New Mexico (UDWR 2002). Currently, Columbian sharp-tailed grouse occur in only 5% of their historic rang-wide distribution (UDWR 2002). Columbian sharp-tailed grouse populations in the U.S., including Idaho, are much lower than historic levels (Hoffman et al. 2015) and Columbian sharp-tailed grouse currently occupy less than 10% of their historic range with >95% of remaining breeding birds found within three metapopulations: south-central British Columbia; northern Utah and southwestern Idaho; and northwestern Colorado and south-central Wyoming (USFWS 2000, Hoffman et al. 2015). Idaho supports an estimated 63% of the remaining Columbian sharp-tailed grouse in the United States (briefing paper prepared by J. Knetter, IDFG, for Idaho Fish and Wildlife Commission meeting, dated May 20, 2015). Some populations in Idaho have increased since the 1980s as a result of the implementation of the Conservation Reserve Program (J. Knetter, IDFG, pers. comm. 2015) administered by the USDA Farm Services Agency (IDFG 2015a).

Predation is the leading cause of mortality and nest failures of Columbian sharp-tailed grouse (Hoffman et al. 2015, IDFG 2015a). Bergerud (1988a) reports that predation accounts for over 85% of all causes of mortality and 79% of all nest failures. Identifying cause-specific mortality in grouse is difficult (Lariviere 1999, Bumann and Stauffer 2002) and identifying a specific predator is even more challenging, especially for prey such as Columbia sharp-tailed grouse that have a large suite of predators, none of which specialize on the grouse as their primary food source (Connelly et al. 1998, Hoffman and Thomas 2007). Excluding hunting, Bergerud (1988a) found that predation accounted for 85% of the range-wide reported mortality rates. Hart et al. (1950) attributed 93% of Columbian sharp-tailed grouse mortalities in Utah to mammalian predators, whereas Marks and Marks (1987) cited avian predators were responsible for 86% of Columbian sharp-tailed grouse mortalities in western Idaho. Meints (1991) found that avian predators were the major source of mortality for radio-marked Columbian sharp-tailed grouse in eastern Idaho, with hunting and unknown causes each accounting for 29% of documented mortalities and mammalian predation accounting for 9%. In a study conducted by Coates (2001), he found that mammalian predation (51%) was the primary cause of mortality of translocated Columbian sharp-tailed grouse in northern Nevada, followed by avian predation (28%) and unknown causes (21%). Known and suspected predators of Columbian sharp-tailed grouse include northern goshawk (*Accipiter gentilis*), golden eagle, great horned owl (*Bubo virginianus*), prairie falcon (*Falco mexicanus*), red-tailed hawk (*Buteo jamaicensis*), Cooper's hawk (*Accipiter cooperii*), northern harrier (*Circus cyaneus*), Swainson's hawk (*B. swainson*), ferruginous hawk (*B. regalis*), common raven, gulls (*Larus* spp.), bobcat, red fox, coyote, American badger, weasel, rattlesnake (*Crotalus* spp.) and gopher snake (*Pituophis catenifer*) (Hoffman et al. 2015). While some of these predators take grouse year-round, others only take grouse at certain time of the year and still others may only prey on chicks or partially-grown juveniles (Hoffman et al. 2015).

Based on data collected across the west, approximately 51% of all Columbian sharp-tailed grouse nests fail (Hoffman et al. 2015). The same mammalian predators that prey upon Columbian sharp-tailed grouse also are known to consume their eggs (Hart et al. 1950, McDonald 1998, Collins 2004). Additional mammalian nest predators include striped skunk and common raccoon. Black-billed magpie, common raven, American crow and gulls are known avian predators for Columbian sharp-tailed grouse nests (Connelly et al. 1998, Schroeder and Baydack 2001, Hoffman and Thomas 2007). McDonald (1998) concluded coyotes and common ravens destroyed the majority of Columbian sharp-tailed grouse nests in eastern Washington. Collins (2004) attributed 56% of Columbian sharp-tailed grouse nest depredations in northwestern Colorado to mammals, 6% to avian predators, and 38% to unknown predators. Predators were responsible for 91% of all nest failures in southeastern Idaho. Of 30 documented nest predation events recorded by video-monitoring, 16 were caused by American badger, eight by coyotes, two by common ravens and one each by a striped skunk, long-tailed weasel, black-billed magpie and cow (Gillette

2014). Ground squirrels (*Spermophilus* spp.) had previously been identified as egg predators of sharp-tailed grouse nests (Connelly et al. 1998, Schroeder and Baydack 2001). However, using video-monitoring and still photography, other investigators demonstrated that although ground squirrels frequently visited grouse nests, they did not take undamaged eggs (Holloran and Anderson 2003, Coates et al. 2008). Ground squirrels were recorded scavenging egg shells and membranes from successful nests or nests that were destroyed by other predators. Coates et al. (2008) cautioned that sign left at scavenged nests may result in incorrectly attributing predation events to ground squirrels. Michener (2005) found Richardson's ground squirrels (*S. richardsonii*) were incapable of puncturing or carrying off undamaged greater sage-grouse eggs because their functional gape-width was smaller than the average width of sage-grouse eggs. This same argument applies to Columbian sharp-tailed grouse eggs (i.e., the maximum (26 mm) and functional (17 mm) gape-width of Columbian sharp-tailed grouse eggs (30-34 mm)) (Connelly et al. 1998). Gillette (2014) monitored 64 Columbia sharp-tailed grouse nests using videography and recorded only one unidentified rodent visiting a nest. The rodent made no attempt to remove any eggs.

The role of snakes in predation of Columbian sharp-tailed grouse nests has not been well documented. Egg predation by snakes in grassland and shrub habitats may be more frequent than previously considered. Gopher snakes accounted for 19% of 161 nest depredations of lesser prairie-chickens in southwestern Kansas (Pitman et al. 2006). Collins (2004) suspected gopher snakes were responsible for the disappearance of six entire clutches of Columbian sharp-tailed grouse eggs in northwestern Colorado. However, other common predators may have been responsible for the losses. Similar to snakes, badgers and ravens sometimes remove or consume entire clutches, leaving no eggs or shell fragments behind (Coats et al. 2008, Gillette 2014). No snakes were recorded visiting 64 Columbia sharp-tailed grouse nests under video surveillance in Idaho (Gillette 2014).

Grouse have evolved with predators and developed strategies to compensate for high predation rates (Hoffman et al. 2015). Thus, predation is generally not a factor limiting grouse populations, provided large tracts of suitable habitat are available (Bergerud 1988b, Schroeder and Baydack 2001, Hagen 2011). However, large tracts of undistributed habitat are seldom available because human activities have drastically altered landscapes within the range of Columbian sharp-tailed grouse (Hoffman et al. 2015). This situation may have disrupted the balance between predators and prey in ways that favor certain predators (Hoffman et al. 2015). The extent to which human activities have influenced predation on Columbian sharp-tailed grouse has yet to be determined, but it is likely human-related factors have contributed to increases in some predator populations, allowed other predators to expand their range, and improved hunting efficiency of other predators (Bergerud 1988b). For example, higher densities of corvids and a concomitant increase in predation rates of sharp-tailed grouse nests were associated with human-induced changes in landscapes in southeastern Alberta (Manzer and Hannon 2005). In southern Idaho and Oregon, raptors and common ravens began nesting on towers along a 596-km transmission line within one year of construction. Ten years after construction, 133 pairs of raptors and ravens were nesting along the line (Steenhof et al. 1993).

As prairie grouse populations become smaller in size and more threatened in status, managers will probably need to consider additional options for management of prairie grouse-predator relationships, including direct control of predator numbers (Schroeder and Baydack 2001, Hagen 2011). The question remains whether such action will be effective in obtaining conservation goals (Hagen 2011). Following a meta-analysis of 20 published predator- removal studies, 12 of which involved game birds, Cote and Sutherland (1997) concluded that although predator removal fulfilled goals of increasing harvestable post-breeding populations, such management was much less consistent in achieving conservation goals to increase breeding populations. Development of effective predator management programs to increase Columbian sharp-tailed grouse breeding populations will require a better understanding of predator communities as they relate to habitat variables and demographic rates of Columbian sharp-tailed grouse. Even with this information, predator removal programs designed to increase breeding populations may be plagued with technical problems (Cote and Sutherland 1997).

Hoffman et al. (2015) provides updated guidelines for the management of Columbian sharp-tailed grouse and suggests that predator management is best addressed by protecting and enhancing existing habitats, restoring previously occupied habitats, increasing connectivity between suitable habitats and reducing or modifying factors that facilitate predation (Hoffman et al. 2015). Predator control is only recommended under extenuating circumstances and should not be viewed as a long-term solution to predation issues (Hoffman et al. 2015). However, after three years of monitoring the movement, survival and reproduction of reintroduced Columbian sharp-tailed grouse in northeastern Nevada, Coates and Delehanty (2001) recommended that future reintroductions of sharp-tailed grouse be preceded by two months of predator control to increase survival of released birds. Similarly, the IDFG draft management plan for conservation of Columbian sharp-tailed grouse in Idaho states that habitat management or manipulation is generally considered the appropriate tool to manage predator impacts on Columbian sharp-tailed grouse and other prairie grouse populations (IDFG 2015a). WS-Idaho is not currently conducting PDM for Columbian sharp-tailed grouse population enhancement and, unlike sage-grouse, does not have any pending requests to conduct this type of PDM.

Mule Deer and White-tailed Deer. Mule deer and white-tailed deer are big game species in Idaho. Populations of mule deer have fluctuated historically and while numbers are greater today than they were 100 years ago, they have been in sharp decline over the past 15-20 years. Numerous factors likely contribute to declines including degraded habitat in terms of reduced forage productivity from cumulative impacts of land uses and practices, invasive plants and weeds, weather, fire management, human population growth and development and climate have all likely contributed to the recent decline in mule deer numbers in Idaho. Conversely, white-tailed deer populations statewide have increased over the past 15 to 20 years.

Connolly (1978) reviewed 68 studies of predation on wild ungulate populations and concluded that in 31 cases, predation was a limiting factor. These cases showed that coyote predation had a significant influence on white-tailed deer and mule deer, pronghorn antelope and bighorn sheep populations. Hamlin et al. (1984) observed that a minimum of 90% summer mortality of fawns was a result of coyote predation. Pojar and Bowden (2004) found for mule deer fawns in Colorado that 75% of predation mortality occurred by July 31. The habitat in this study is similar to high mountain desert areas of southern Idaho. One study in the central Sierra Nevada in California found that predation was the largest cause of fawn loss, resulting in the death of 50.6% of all fawns during the first 12 months of life. In this instance, mountain lions were the main predator; however, coyotes still accounted for 27% of all predation (Neal 1990). Mackie et al. (1998) documented that high winter loss of mule deer to coyote predation in the Missouri River Breaks of north-central Montana was the cause for 95% of the fawn mortality during the winters of 1976-86. Remains of four to eight week old fawns were also common in coyote scats (feces) in studies from Steele (1969), Cook et al. (1971), Holle (1977), Litvaitis (1978) and Litvaitis and Shaw (1980). Mule deer fawn survival was significantly increased and more consistent inside a predator-free enclosure in Arizona (LeCount 1977, Smith and LeCount 1979). Hamlin et al. (1984) observed that a minimum of 90% summer mortality of fawns was a result of coyote predation. Trainer et al. (1981) reported that heavy mortality of mule deer fawns during early summer and late autumn and winter was limiting the ability of the population to maintain or increase itself. Their study concluded that predation, primarily by coyotes, was the major cause for low fawn survival on Steens Mountain in Oregon.

Other authors also observed that coyotes were responsible for the majority of fawn mortality during the first few weeks of life (Knowlton 1964, White 1967). Teer et al. (1991) concluded from work conducted at the Welder Wildlife Refuge in Texas, that coyotes take a large portion of the fawns each year during the first few weeks of life. Another Texas study (Beasom 1974a, 1974b) found that predators were responsible for 74% and 61% of the fawn mortality for two consecutive years. Garner et al. (1976) and Bartush (1978) found annual losses of deer fawns in Oklahoma to be about 88%, with coyotes responsible for about 88% to 97% of the mortality. Reductions of local coyote and other predator populations have been shown to result in increasing fawn survival of white-tailed deer (Guthery and Beasom 1977, Stout 1982, Knowlton and Stoddart 1992) and pronghorn antelope (Arrington and Edwards 1951, Smith et al. 1986, Brown and Conover 2011).

Harrington and Conover (2007) observed a positive correlation between the intensity of coyote removal effort (hours spent aerial shooting) and number of coyotes removed and the total number of mule deer and pronghorn antelope although no differences were observed in fawns/female ratios. Reasons for the observed difference could have been that deer and antelope numbers were already high in the project area (unlikely given that deer and antelope tend to avoid areas with high cattle densities), or that deer and antelope moved away from areas with high coyote densities to areas with fewer coyotes. Sufficient data were not provided to determine if the increase in deer and antelope occurred at a landscape scale or if the increase was a redistribution of the existing population over the landscape.

Other authors observed that coyotes were responsible for most of fawn mortality during the first few weeks of life (Knowlton 1964, White 1967). Guthery and Beasom (1977) demonstrated that after coyote damage management, deer fawn production was more than 70% greater after the first year and 43% greater after the second year in their southern Texas study area. Stout (1982) observed increased deer production in three areas in Oklahoma by 262%, 92% and 167% the first summer following coyote damage management, an average increase of 154% for the three areas. A study by Knowlton and Stoddart (1992) indicates the complexity of PDM for game species enhancement and understanding the relationship between prey density and carrying capacity of the environment. Knowlton and Stoddart (1992) reviewed deer productivity data from the Welder Wildlife Refuge following coyote reduction. Deer densities tripled compared with those outside the enclosure, but without harvest management, ultimately returned to original densities due primarily to malnutrition and parasitism.

Between 1997 and 2002, Hurley et al. (2011) studied the effects of increased harvest rates on coyotes and mountain lions in southeastern Idaho. Coyote predation on neonatal fawns during summer was offset by increased malnourishment during winter, indicating total annual coyote mortality was largely compensatory. The degree to which coyote predation was either additive or compensatory was influenced by alternate prey and weather conditions. During periods of low lagomorph (i.e., rabbits) or microtine populations (i.e., voles, shrews and field mice) and mild winter conditions, coyote predation was partially additive. Coyotes are considered a facultative predator of mule deer (Ballard et al. 2003) (i.e., they do not tend to typically predate upon deer, but may do so if circumstances such as deep snow make mule deer easier to obtain) readily available such as deep snow) and prefer small mammals. Results from the southeastern Idaho study were consistent with other coyote removal studies reviewed by Ballard et al. (2003). Conversely, mountain lion predation of mule deer in southeastern Idaho was considered largely additive (Hurley et al. 2011). Mule deer survival and recruitment increased with lion removal resulting in slight population increases during the most intense mountain lion removal periods (IDFG 2008). WS-Idaho is not currently conducting PDM for mule or white-tailed deer population enhancement and, unlike sage-grouse, does not have any pending requests to conduct this type of PDM. Similarly, Brown and Conover (2011) assessed the relationship between the number of coyotes removed and mule deer and pronghorn antelope productivity and abundance in two large areas in Wyoming. Although there was a positive correlation between pronghorn productivity and abundance and number of coyotes removed and removal effort (hours spent aerial shooting), there was no correlation between coyotes remove and mule deer productivity or abundance. Given the information above, particularly that from Hurley et al. (2010) WS-Idaho does not anticipate receiving any requests to conduct coyote removal for deer population enhancement.

Bighorn Sheep. Bighorn sheep are one of Idaho's most prized trophy game animals. Idaho is home to two distinct populations of bighorn sheep. California bighorns occupy canyon and desert habitat in southwestern and south-central Idaho, south of Interstate 84. Rocky Mountain bighorns live in the central mountains from Hells Canyon on the west to the Montana border on the east (IDFG 2013b). From historical records, bighorn sheep ranged widely in Idaho in the early 1800s and are believed to have been one of the most abundant game animals in the State prior to the mid-1800s. However, bighorn sheep populations started declining and Idaho estimated 1,000 in the State in the early 1920s, mostly in the Salmon River drainage (IDFG 2013b). In the 1960s, Idaho began efforts to reestablish bighorn populations, primarily in the Owyhee River area and southern Idaho.

Some translocations of bighorn sheep to reestablish populations in areas of their historic range have been successful, but others have failed and causes of failure are poorly understood (Douglas and Leslie 1999, McKinney et al. 2003). Disease, dispersal, predation, presence of cattle and habitat quality have been cited as potential causes of translocation failures (Rominger et al. 2004, McKinney et al. 2006, Dickens et al. 2010). Recently, predation by mountain lions was suggested as a factor affecting bighorn sheep populations in Arizona (Kamler et al. 2002) and other western States (Krausman et al. 1999, Rominger and Weisenberger 1999, Rominger et al. 2004). In a study by McKinney et al. (2006), unmarked and radio collared desert bighorn sheep were translocated to 12 areas in Arizona between 1979 and 1995. They reported that 14.6% (54/369) of radio collared bighorn sheep died due to mountain lion predation and that 75% (39/52) were killed ≤ 1 year after release. Of all known deaths, but excluding legal harvest, 64% were due to mountain lion predation, 20% due to accidents and natural causes, 11% due to disease and 5% due to bobcat or coyote predation (McKinney et al. 2006). Of all predator- related deaths, mountain lions accounted for 88% (McKinney et al. 2006). In a study by Rominger et al. (2004) in New Mexico during 1993 where two translocated populations of bighorn sheep were established, mountain lion predation was the primary proximate cause (75%) of 16 known-caused mortalities of radio-marked sheep in the Sierra Ladron population. Mountain lion predation appears to have hampered desert bighorn sheep translocation efforts in Arizona, Colorado, New Mexico, Texas and Utah (Krausman et al. 1999, Rominger et al. 2004). WS-Idaho is not currently conducting PDM for bighorn sheep protection and, unlike sage-grouse, does not have any pending requests to conduct this type of PDM.

Pronghorn Antelope. Jones (1949) believed that coyote predation was the main limiting factor of pronghorn antelope in Texas. A six-year radio telemetry study of pronghorn antelope in western Utah showed that 83% of all fawn mortality was attributed to predators (Beale and Smith 1973). In Arizona, Arrington and Edwards (1951) showed that intensive coyote damage management was followed by an increase in pronghorn antelope to the point where antelope were once again huntable, whereas on areas without coyote damage management this increase was not noted. Similar observations of improved pronghorn antelope fawn survival and population increase following damage management have been reported by Riter (1941), Udy (1953) and Smith et al. (1986). Major losses of pronghorn antelope fawns to predators have been reported from additional radio telemetry studies (Beale 1978, Barrett 1978, Bodie 1978, Von Gunten 1978, Tucker and Garner 1980). Coyote damage management on Anderson Mesa, Arizona increased the herd from 115 animals to 350 in three years, peaking at 481 animals in 1971 (Neff et al. 1985). After coyote damage management was stopped, the pronghorn fawn survival dropped to only 14 and 7 fawns per 100 does in 1973 and 1979, respectively. Initiation of another coyote damage management program began with the reduction of an estimated 22% of the coyote population in 1981, 28% in 1982 and 29% in 1983. Pronghorn antelope populations on Anderson Mesa, during 1983, showed a population of 1,008 antelope, exceeding 1,000 animals for the first time since 1960. Fawn production increased from a low of seven fawns per 100 does in 1979 to 69 and 67 fawns per 100 does in 1982 and 1983, respectively. After a five-year study, Neff and Woolsey (1979, 1980) determined that coyote predation on pronghorn antelope fawns was the primary factor causing fawn mortality and low pronghorn densities on Anderson Mesa, Arizona. Smith et al. (1986) noted that controlling coyote predation on pronghorn fawns could result in 100% annual increases in population size and that coyote removal was a cost-effective strategy in pronghorn antelope management. WS-Idaho is not currently conducting PDM for pronghorn antelope protection and, unlike sage-grouse, does not have any pending requests to conduct this type of PDM.

Northern and Southern Idaho Ground Squirrel. The USFWS designated the northern Idaho ground squirrel as a federally-listed threatened species on October 5, 2000 (Federal Register (FR) 66, Vol. 65, p 17779). In 2010, a five-year review was started to assess the listing status of the northern Idaho ground squirrel and evaluate where the population is in regards to meeting recovery goals. A final report was issued on September 13, 2011, which determined that none of the recovery criteria have been achieved (USFWS 2011a). The report stated that of the 17 metapopulations identified in the Recovery Plan, only five have populations of greater than 100 individuals each. One delisting criteria indicates there must be a least ten metapopulations having a minimum of 500 individuals for five consecutive years. The majority of the metapopulations occur in Adams County.

In October 2001, the USFWS determined that the southern Idaho ground squirrel warranted protection under the ESA, but was precluded from listing by other priorities. It is currently designated as a candidate species for listing. The southern Idaho ground squirrel currently exists in only a few locations in Gem, Payette and Washington Counties. A 1999 survey of known historic population sites for the southern Idaho ground squirrel revealed only 53 sites occupied, with most of these sites containing fewer than 20 individuals.

Although predation by raptors, badgers and other species is a normal part of life for northern and southern Idaho ground squirrels, at current low population levels, any predation could have a substantial negative impact on the population. Badger predation is a particularly significant problem because ground squirrels have no safe refuge from the badger's highly effective digging behavior. Badgers prey on nursing young, especially just before their first emergence above ground, and also dig out many burrows just after seasonal emergence (Yensen and Sherman 1997). With so few of these ground squirrels left, loss of even a single population should be avoided. In the USFWS recovery plan for northern Idaho ground squirrels, predator control has been identified as a necessary conservation tool (USFWS 2003) and an ESA five-year review of the northern Idaho ground squirrel (USFWS 2011a) stated that ongoing predation by badgers, raptors and weasels continues to threaten the ground squirrel's populations.

During FY 2012-FY 2014, WS-Idaho conducted 21 work tasks investigating predation on northern Idaho ground squirrels. Of those work tasks, 95% involved badgers and 5% coyotes. WS-Idaho anticipates ongoing requests to provide similar levels of assistance for northern Idaho ground squirrel protection.

Waterfowl (ducks). In a study of duck nesting success in Canada, researchers found that eggs in most nests were lost to predators such as red foxes, coyotes, striped skunks, raccoons, Franklin's ground squirrels (*S. franklinii*), badgers, black-billed magpies and crows (Johnson et al. 1988). Cowardin et al. (1985) determined that predation was by far the most important cause of nest failure in mallards (*Anas platyrhynchos*) on their study area. Various studies have shown the skunk and raccoon to be a major duck nest predator resulting in poor nesting success (Keith 1961, Urban 1970, Bandy 1965). On the IDFG Sterling Wildlife Management area in southern Idaho, striped skunks, red fox and black-billed magpies were documented as common predators of nesting ducks (northern shoveler, gadwall, cinnamon teal, northern pintail, redhead and lesser scaup), with magpie predation identified as the most significant factor limiting waterfowl production (Gazda and Connelly 1993).

In documenting an extensive study of the effects of red fox predation on waterfowl in North Dakota (Sargeant et al. 1984), the authors concluded that reducing high levels of predation was necessary to increase waterfowl production. Balser et al. (1968) determined that PDM resulted in 60% greater production in waterfowl in areas with damage management as compared to areas without damage management. He also recommended that when conducting PDM, the entire complex of potential predators should be targeted or compensatory predation may occur by a species not under control, a phenomena also observed by Greenwood (1986). Rohwer et al. (1997) documented a 52% nesting success for upland nesting ducks in an area receiving predator control, versus only a 6% nesting success in a similar non-treatment area.

Garrettson and Rohwer (2001), likewise, documented dramatically higher duck nesting success in areas where predators were removed during the nesting season as compared to areas where no predators were removed and noted that the annual nature of predator removal allowed for greater management flexibility than most habitat management efforts.

The Delta Waterfowl organization, a national waterfowl conservation group, states that predator management is the most cost-effective waterfowl management tool available to increase annual duck production. By removing predators, Delta Waterfowl trappers are routinely able to double the percentage of nests that successfully hatch on managed sites (Delta Waterfowl 2014). WS-Idaho is not currently conducting PDM for waterfowl protection and, unlike sage-grouse, does not have any pending requests to conduct this type of PDM.

1.2.4 Predator Damage Management to Protect Public Safety

WS-Idaho conducts limited PDM actions to reduce human health and safety concerns of the public. Human health and safety concerns may include: abnormal or aggressive behavior by wildlife; attacks by mountain lions; attacks by black and grizzly bears and 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 and raccoons under houses; and airstrike hazards from ravens and coyotes crossing runways at airports or airbases. The IDFG has lead responsibility for responding to complaints of black bears or mountain lions causing a nuisance or public safety concern (IDFG 2006). WS-Idaho provides assistance in responding to these types of incidents when requests are received from the IDFG.

Recommendations are generally made to consider exclusion methods to reduce human health and safety concerns, but the animals present may be lethally removed. During FY 2012-FY 2014, WS-Idaho personnel performed an annual average of 37 work tasks to address human, health and safety concerns. WS-Idaho has documented that coyotes (33%); mountain lions (27%); striped skunks (14%); raccoons (12%); black bears (5%); and bald eagles, feral cats, badgers, red-tailed hawks and red foxes (remaining 9%), were involved in human health and safety concern requests (MIS 2014).

Risks associated with aggressive/habituated animals. Predator attacks on humans fortunately occur very rarely. After several human-coyote interactions in southern California, Baker and Timm (1998) concluded that the use of foothold traps to capture and euthanize a few coyotes would be the best method to resolve the problem and have the most lasting effects. After a child was killed by a coyote in Glendale, California, 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). WS-Idaho assists many residents in the Treasure Valley area concerned about coyote attacks on their pets and their apparent loss of fear of humans.

Human interactions with black or grizzly bears and mountain lions could occur wherever habitat or food sources overlap with human activities. Black or grizzly bears and mountain lions may pose a potential threat when they habituate to urban or residential locations, or recreation areas such as campgrounds or picnic areas. The IDFG responds to most such instances by live capturing black and grizzly bears in culvert traps and relocating them.

Although rare, mountain lion attacks on humans in the western U.S. and Canada have increased, primarily due to increased lion populations and human use of lion habitats (Beier 1992). No lion-caused fatalities have been documented in Idaho, but recent fatal attacks in California and Colorado emphasize the need for awareness. During the FY 2012-FY 2014, WS-Idaho reported 30 incidents involving mountain lions; six incidents involving black bears; and three incidents involving red-tailed hawks that were perceived as posing a direct threat to public safety.

Wildlife hazards to aircraft. Coyotes, red foxes, badgers, bald and golden eagles, feral and free-ranging dogs and feral cats sometimes create human safety threats when they spend time on or near airport runways. Although there have not yet been any reported incidents of these species actually being struck by departing or landing aircraft in Idaho, such incidents have occurred at airports in other States. WS-Idaho has responded to a number of requests from airports in Idaho where the presence of small predators and domestic animals on the runway was considered a potential public safety hazard. Additionally, the digging activity of badgers near or adjacent to taxiways and runways will sometimes deposit soil, rocks and other debris on the aircraft movement areas, creating a hazard of these items being ingested into jet engines, possibly resulting in damage.

Coyotes can be a risk to human safety when they spend time on airport runways. Although there have not yet been any reported incidents of coyotes actually being struck by departing or landing aircraft in Idaho, such incidents have occurred at airports in other States. WS-Idaho has responded to a number of requests from airports in Idaho where the presence of coyotes on the runway was considered a potential public safety hazard.

1.2.5 Wildlife Disease Surveillance

WS-Idaho has collected blood and tissue samples from captured animals for multiple diseases in the last several years as part of various WS National Wildlife Disease Program surveillance projects and/or in cooperation with IDFG for general disease surveillance of wildlife that may pose a threat to human health and safety, natural resources and/or agriculture. From FY 2011 to FY 2013, WS-Idaho collected 123, 32, and 49 blood samples, respectively, from mammalian predators (primarily coyotes) to test for the presence of a plague titer. Blood or tissue samples are obtained opportunistically from animals taken during regular PDM activities.

Therefore, because WS-Idaho disease monitoring efforts occur during regular PDM activities, they do not result in additional predator mortality. Plague blood results are plotted on maps and provided to the Idaho Department of Health and Welfare for their information.

The increase in raccoon damage and the potential for disease transmission has raised concern in many residential areas where the majority of raccoon damage complaints originate. The raccoon is known to adapt to and flourish amidst human activities and urban development in Idaho. One serious concern associated with urban raccoons is the presence of the raccoon roundworm (*Baylisascaris procyonis*). The raccoon roundworm is a parasite that can cause severe health problems and fatalities in humans, with children being particularly at risk (CDC 2002). Raccoon roundworm was known to occur in Idaho but a surveillance project conducted by IDFG in 2005 confirmed it was present with a high rate of prevalence in the Treasure Valley area of southwest Idaho. WS-Idaho provides operational and technical assistance, as well as providing a trap loan program. During FY 2011 and FY 2012, 16 and 6 blood samples, respectively, were collected on animals that were captured through the trap loan program in Idaho. This sampling project is no longer active, but it may be reinstituted in the future.

An issue of importance in Idaho is the presence of *Echinococcus granulosis* (a tapeworm) in wild canids which was first discovered in wolves in Idaho in 2006. *E. granulosus* and *E. multilocularis* are well documented as zoonotic diseases of humans with a worldwide distribution. The human infection with the northern biotype of *E. granulosis* is relatively benign (Rausch 2003) and causes hydatid cysts, most commonly in the liver and lungs (Meltzer et al. 1956, Gottstein 1992), but is known to occur worldwide. Human infection with the domestic biotype of *E. granulosus* is considered to be more severe than the northern biotype (McManus et al. 2002), largely due to the potential for brain involvement. Most of the reported human cases occur in northern North America, Central America and South America (Williams et al. 1971). WS-Idaho collected 45 samples in FY 2010 and 32 samples in FY 2014 for *E. granulosis* testing by IDFG. All samples collected were obtained opportunistically from animals taken during regular PDM activities. This sampling project is ongoing.

Leptospirosis is a contagious disease of swine and many other animals, including humans, and is caused by a bacterial infection with any one of a large group of *Leptospira* spp. Leptospirosis is most commonly transmitted through direct or indirect contact with contaminated urine (Leptospirosis Surveillance Procedures Manual-WS National Wildlife Disease Program, May 2013). As part of a national Leptospirosis surveillance project, WS-Idaho collected 15 samples (7 during FY 2013 and 8 in FY 2014). All samples collected were obtained opportunistically from animals taken during regular PDM activities. This sampling project is ongoing.

Aleutian Disease (AD) is a parvovirus of ranched mink that is associated with poor kit production and adult mortality. All color phases of ranched mink are susceptible, but the light colors derived from the Aleutian color phase are most prone to the disease. Ranched mink can be tested for AD and an eradication program implemented. Wild carnivores are thought to be a potential reservoir for AD in ranched mink (M. Drew, DVM, IDFG, pers. comm. 2014). An AD sampling project was conducted in Idaho in FY 2008 and FY 2009 with collection of 39 samples (25 in FY 2008 and 14 in FY 2009). Of the 39 samples collected, 30 were targeted removals for sample collection while the remaining nine samples were opportunistically collected. It is not expected that any further AD sampling would be conducted unless a major AD outbreak occurs.

Neospora caninum is a protozoan parasite of animals. Until 1988, it was misdiagnosed as *Toxoplasma gondii* (Dubey et al. 1988). Since its first recognition in 1984 in dogs in Norway (Bjerkås et al. 1984) and the description of the new genus and species *N. caninum* by Dubey et al. (1988), neosporosis has emerged as a serious disease of cattle and dogs worldwide. Abortions and neonatal mortality are a major problem in livestock operations and neosporosis is a major cause of abortion in cattle (Dubey et al. 2007). In North America, there are data consistent with a sylvatic cycle involving white tailed-deer and canids. A joint IDFG and WS-Idaho neosporosis surveillance project is planned to conduct surveillance activities of wildlife near several *N. caninim* positive cattle herds in Idaho. This project would include both active and opportunistic sample collections of canines (coyotes, red fox and gray wolves). It is expected that no more than 50 canine samples would be collected and tested.

1.3 BACKGROUND INFORMATION

1.3.1 Predators in Idaho That Cause Damage

To conduct PDM, it is important to have knowledge about the species that can cause damage. Full accounts of life histories for these species can be found in mammal and bird reference books and field guides. Some background information is given here for each species in Idaho covered by this EA, especially information pertaining to their range and distribution in Idaho.

Coyote. IDFG classifies coyotes as "Unprotected" and "Predatory Wildlife" (Idaho Statute 36-201). Because coyotes are classified as Predatory Wildlife, they can be taken in any amounts and at any time by holders of the appropriate valid Idaho hunting, trapping or combination hunting license, provided such taking is not in violation of State, county or city laws, ordinances or regulations. Other predatory wildlife include jackrabbits (*Lepus townsendii* and *L. californicus*), skunks, weasels, [European] starlings (*Sturnus vulgaris*) and raccoons. IDFG oversees predatory wildlife management, preservation and protection; however, the ISADCB is responsible for prevention and control of damage caused by predatory wildlife. That responsibility is delegated to WS-Idaho by way of an MOU dated February 3, 2011 (ISADCB 2011a). Coyotes cause the most damage of the predators in Idaho and, therefore, are one of the major focuses of WS-Idaho PDM efforts.

Coyotes were once found primarily in western States, but have expanded their range in recent history to much of North America. They are very common in Idaho and found statewide. This species is often characterized by biologists and rangeland managers as having a unique resilience to change because they have a strong ability to adapt to adverse conditions and persevere.

Coyote home ranges may vary from 2.0 mi^2 to 21.3 mi^2 depending on habitat quality (Andelt and Gipson 1979, Gese et al. 1988). Although coyotes are generally considered territorial, Ozoga and Harger (1966), Edwards (1975) and Danner (1976), observed a wide overlap between coyote home ranges. Each occupied coyote territory may have several nonbreeding helpers at the den during whelping (Allen et al. 1987). Therefore, each defended coyote territory may have more than just a pair of coyotes. Messier and Barrette (1982) reported that from November through April, 35% of the coyotes were in groups of three to five animals and Gese et al. (1988) reported that coyote groups of two, three, four and five comprised 40%, 37%, 10% and 6% of the resident population, respectively. The presence of unusual food concentrations and nonbreeding helpers at the den can influence coyote densities and complicate any effort to estimate abundance (Danner and Smith 1980). A positive relationship was established between coyote densities in mid-late winter and the availability of dead livestock (Roy and Dorrance 1985).

Black bear. IDFG classifies black bears as big game animals in Idaho and IDFG is responsible for management, preservation and protection of black bears in Idaho. However, through MOUs between IDFG and ISADCB (IDFG 2006) and ISADCB and WS-Idaho (ISADCB 2011*a*), WS-Idaho has the responsibility for control of black bears involved in livestock depredations and any other agriculture-related depredation problems. IDFG may handle these complaints at the request of WS-Idaho if mutually agreed upon by the IDFG Regional Supervisor and WS-Idaho's District Supervisor. In addition, Idaho Statute 36-1107(b) allows the disposal of depredating black bears by livestock owners, their employees and agents when black bears are molesting or attacking livestock and it is unnecessary to obtain any permit from the IDFG. Regulated sport hunting of black bears is allowed by the Idaho Fish and Game Commission in Idaho with much of the State having spring and fall general hunting seasons. External evidence of sex must be left naturally attached to the hide until mandatory check requirements have been satisfied and the skull and hide must be presented to an IDFG regional office, official check point or an IDFG conservation officer for removal and retention of a premolar tooth and to have the hide tagged with an official State export tag.

Black bears can be found throughout the Rocky Mountains and west coast mountain ranges. Female black bears reach reproductive maturity at approximately 3.5 years (Kohn 1982, Graber 1981). Following a 7-8 month gestation period, they may have one to five cubs (Rogers 1976, Alt 1981, Kolenosky and Strathearn 1987). Juvenile black bear annual mortality ranges between 20 and 70 percent, with orphaned cubs having the highest mortality (Kolenosky and Strathearn 1987). Natural mortality in adult black bears is approximately 10-20 percent per year (Fraser et al. 1982).

Grizzly Bear. In Idaho, grizzly bears are listed by the USFWS as threatened under the ESA, except for areas in the Bitterroot Grizzly Bear Recovery Zone (Bitterroot Ecosystem (BE)) of central Idaho where they are classified as an experimental, non-essential population. Regulated sport hunting of grizzly bears in Idaho is not allowed. Under the terms of a 2006 MOU between the IDFG and ISADCB (IDFG 2006), WS-Idaho has the lead responsibility for the capture and restraint of grizzly bears involved in livestock depredations in Idaho. WS-Idaho coordinates activities with the USFWS and IDFG on any grizzly bear capture efforts. All grizzly bear activities are conducted under the authority of Section (i)(C) and (D) of the grizzly bear 4(d) rule, 50 Code of Federal Regulations (CFR) 17.40(b), through a subpermit issued by the USFWS Grizzly Bear Recovery Coordinator.

Grizzly bears are one of the largest carnivores ranging in size from about 3 to 9 feet in length and 36 to 60 inches tall at the shoulder. Grizzly bears can tower at a height of 8 feet when standing upright on their hind legs. They range in weight from about 175 lbs. to more than 1,300 lbs. On average, adult males are 8 to 10% larger than females. Coloration is usually darkish brown but can vary from very light cream to black. The long guard hairs on their back and shoulders often have white tips and give the bears a "grizzled" appearance, hence the name "grizzly." They have an excellent sense of smell (i.e., able to follow the scent of a rotting carcass for more than two miles), human level hearing, but relatively poor eyesight. Grizzly bears are extremely strong and have good endurance. Grizzly bears may be distinguished from black bears by a distinctive hump on the shoulders, a dished profile to the face, and long claws about the length of a human finger.

The USFWS proposed to designate critical habitat for grizzly bears in 1976 (41 FR 48757-48759) but the proposal was never finalized. The grizzly bear was listed in the lower 48 States on July 28, 1975 (40 FR 31734-31736). Recognizing the importance of habitat to the species, instead, the Interagency Grizzly Bear Committee (IGBC) issued habitat management guidelines within all occupied grizzly bear habitat (USFS 1986).

Grizzly bears listed as threatened occur in Bonner, Bonneville, Boundary, Clark, Fremont and Teton counties (http://www.fws.gov/idaho/species/IdahoSpeciesList.pdf) and transient grizzly bears potentially occur in areas adjacent to the recovery areas. Grizzly bears listed as an experimental, non-essential population could potentially occur in Clearwater, Idaho, Lemhi, Shoshone and Valley counties (http://ecos.fws.gov/speciesProfile/profile/countiesByState.action?entityId=1302&state=Idaho, accessed 2 June 2015). The USFWS has determined that the Greater Yellowstone Ecosystem (GYE) population of grizzly bears (within the Idaho counties of; Clark, Fremont, Jefferson, Madison, Teton, Bonneville, Caribou and Bear Lake) has recovered and no longer meets the definition of an endangered or threatened species under the ESA. The USFWS is proposing removing the distinct population segment from the list of species protected under the ESA (81 FR 13173).

Mountain Lion. IDFG classifies mountain lions as big game animals. As such, IDFG is responsible for management, preservation and protection of mountain lions in Idaho.

However, through MOUs between IDFG and ISADCB (IDFG 2006) and ISADCB and WS-Idaho (ISADCB 2011*a*), WS-Idaho has the responsibility for control of mountain lions involved in livestock depredations and any other agriculture-related depredation problems. IDFG may handle these complaints at the request of WS-Idaho if mutually agreed upon by the IDFG Regional Supervisor and WS-Idaho's District Supervisor. In addition, Idaho Statue 36-1107(b) allows the disposal of depredating mountain lions by livestock owners or their employees, agents and WS-Idaho personnel when mountain lions are molesting or attacking livestock and it is unnecessary to obtain any permit from the IDFG. Regulated sport hunting of mountain lions in Idaho is allowed by the Idaho Fish and Game Commission with seasons typically starting August 30 and ending March 31 of each year. The majority of harvest occurs during the winter when hound hunting is permitted and effective. External evidence of sex must be left naturally attached to the hide until mandatory check requirements have been satisfied and the skull and hide must be presented to an IDFG regional office, official check point or an IDFG conservation officer for removal and retention of a premolar tooth and to have the hide tagged with an official State export tag.

Mountain lions have an extensive distribution across Western North America including Idaho. Mountain lions are known by several other names including cougar, panther and puma. Mountain lions inhabit many habitat types from desert to alpine environments, indicating a wide range of adaptability. They are closely associated with deer and elk because of their dependence upon these species as prey.

Female mountain lions typically breed for the first time between 22 and 29 months of age (Ashman et al. 1983), but initial breeding may be delayed (Hornocker 1970). Mountain lions breed and give birth year round but most births occur during late spring and summer following a 90-day gestation period (Ashman et al. 1983, Seidernsticker et al. 1973, Robinette et al. 1961). One to six offspring per litter is possible, with an average of two to three young per litter.

Mountain lion density is related closely to prey availability and intraspecific competition (social tolerance for other mountain lions). Prey availability is directly related to prey habitat quality that directly influences mountain lion nutritional health, reproductive and mortality rates. Studies indicate that as available prey increases, so do mountain lion populations. As mountain lion population density increases, mortality rates from intra-specific fighting and cannibalism also increase and/or mountain lions disperse into unoccupied or less densely occupied habitat. The relationship of the mountain lion to its prey and to other mountain lions is why their densities do not reach levels observed in a number of other wildlife species (ODFW 2006). It is also why mountain lions may disperse into atypical habitat and cause conflicts (Bodenchuk and Hayes 2007). Shaw (1981) presented evidence that livestock such as sheep and calves provide a supplemental prey base that supports mountain lions through seasonal declines in their primary prey, deer which may allow an artificially high density to be reached.

Red Fox. IDFG classifies red foxes in Idaho as a furbearer and the IDFG is responsible for overseeing management of this species. However, under MOUs between IDFG and ISADCB (IDFG 2006) and ISADCB and WS-Idaho (ISADCB 2011*a*), WS-Idaho is responsible for responding to complaints of red fox predation on livestock and poultry and shall periodically notify the IDFG Regional Supervisor of the affected region of areas of suspected depredations. Regulated sport hunting and trapping of red foxes in Idaho is allowed by the Idaho Fish and Game Commission with seasons open year-round in most IDFG Regions. There is no limit on take.

Red foxes are the most common and well-known species in the genus *Vulpes* and are the most widely distributed nonspecific predators in the world (Voigt 1987). Foxes are regarded as nuisance predators in many regions, preying on wildlife and livestock and have become notorious in many areas of the world as carriers of diseases (Ables 1969, Andrews et al. 1973, Tabel et al. 1974, Tullar et al. 1976, Pils and Martin 1978, Sargeant 1978, Voigt 1987, Allen and Sargeant 1993). Red foxes are found throughout much of North America and are common in several counties in Idaho. They tend to predate on smaller livestock, primarily poultry and lambs and cause occasional property damage.

Striped Skunk. IDFG classifies striped skunks as "Unprotected" and "Predatory Wildlife" (Idaho Statute 36-201). As such, they can be taken in any amounts and at any time by holders of the appropriate valid Idaho hunting, trapping or combination hunting license, provided such taking is not in violation of State, county or city laws, ordinances or regulations. IDFG oversees striped skunk management, preservation and protection, however, the ISADCB is responsible for prevention and control of damage caused by predatory animals. That responsibility is delegated to WS-Idaho by way of an MOU dated February 3, 2011 (ISADCB 2011*a*). Striped skunks elicit numerous damage complaints with human health and safety, although property damage is the most common issue.

Striped skunks have increased their geographical range in North America with the clearing of forests. They are capable of living in a variety of environments including agricultural lands and urban areas (Rosatte 1987). Skunks primarily cause odor problems around homes, can transmit diseases such as rabies to humans and domestic animals and sometimes prey on poultry and their eggs. Skunks are primarily targeted to reduce these types of problems and control actions for this purpose are a minor part of WS-Idaho PDM activities.

The home range of striped skunks is not sharply defined over space and time, but is altered to accommodate life history requirements such as raising young, winter dens, feeding activities and dispersal (Rosatte 1987). Home ranges reported in the literature averaged between 0.85 to 1.9/mi^2 for striped skunks in rural areas (Houseknecht 1971, Storm 1972, Bjorge et al. 1981, Rosaette and Gunson 1984).

Raccoon. IDFG classifies raccoons as "Unprotected" and "Predatory Wildlife" in Idaho (Idaho Statute 36-201). As such, they can be taken in any amounts and at any time by holders of the appropriate valid Idaho hunting, trapping or combination hunting license, provided such taking is not in violation of State, county or city laws, ordinances or regulations. IDFG oversees raccoon management, preservation and protection; however, the ISADCB is responsible for prevention and control of damage caused by predatory wildlife. That responsibility is delegated to WS-Idaho by way of an MOU dated February 3, 2011 (ISADCB 2011*a*).

Raccoons are abundant throughout North America, except in central to northern Canada and the Rocky Mountains and Great Basin regions. They can be found in all of Idaho, especially at lower elevations and near water sources and are typically associated with forested habitats, but are especially common in urban areas.

Raccoons are omnivorous, feeding on carrion, garbage, birds, mammals, insects, crayfish, mussels, other invertebrates, a wide variety of grains, various fruits, other plant materials and most or all foods prepared for human or animal consumption (Sanderson 1987). Raccoon problems involve predation on domestic fowl, damage to livestock feed, human health and safety concerns and nuisances.

Badger. IDFG classifies badgers in Idaho as a furbearer and the IDFG is responsible for overseeing management of this species. However, MOUs between IDFG and ISADCB (IDFG 2006) and ISADCB and WS-Idaho (ISADCB 2011*a*) state that WS-Idaho is responsible for responding to complaints of badgers causing damage to property or agricultural resources. Regulated sport hunting and trapping of badgers in Idaho is allowed by the Idaho Fish and Game Commission with seasons open year-round statewide and no limit on take.

Badgers are found throughout most of the western States and are common in Idaho at moderate densities. Body measurements recorded by Messick and Hornocker (1981) in southwestern Idaho for male and female badgers, in total length, were 73.9 cm (29 inches) and 70.8 cm (28 inches), respectively. Adult males weigh an average of 26% more than adult females (Wright 1966) with average adult males and females from southern Idaho and northern Utah weighing 8.7 kg (19 lbs.) and 7.1 kg (15.6 lbs.), respectively (Lindzey 1971), with large males exceeding 11.5 kg (25 lbs.) (Lindzey 1982). The majority of juvenile female badgers (4-5 months) may breed, but males are not sexually mature until about 14 months of age (Wright 1966, 1969). Badgers typically inhabit open grasslands and deserts, but can also be found in the foothills and mountainous habitats. WS-Idaho occasionally receives requests for assistance to resolve damage from badgers for the protection of rangeland, pasture, and cropland.

Feral and Free-ranging dogs. Feral and free-ranging dogs are somewhat common in Idaho. These dogs include those that can be considered "hybrid dogs" (i.e., coyote/wolf and domestic dog crossbred), which are less common. State law considers feral and free-ranging dogs as domestic animals and not wildlife. Feral and free-ranging dog predation on livestock and poultry is not uncommon and they sometimes cause health and safety concerns for people. Feral and free-ranging dogs are also known to prey on native wildlife such as deer and upland game. Primary responsibility for feral and free-ranging dog control rests with county and municipal authorities. Idaho Statute 25-2806 states that "Any person, on finding any dog, not on the premises of its owner or possessor, worrying, wounding or killing any livestock or poultry which are raised and kept in captivity for domestic or commercial purpose, may at the time of so finding said dog, kill the same and the owners thereof can sustain no action for damages against any person so killing such a dog." Although this law provides property owners great flexibility in dealing with dog problems on their own, WS-Idaho personnel are occasionally called upon to provide assistance with dog depredation problems. WS-Idaho personnel are authorized to carry out control activities on feral and free-ranging dogs to protect livestock, poultry and human health and safety only when requested by the Sheriff's Department, other authority or the State or county Health Departments.

Bobcat. IDFG classifies bobcats in Idaho as a furbearer and the IDFG is responsible for overseeing management of this species. However, MOUs between IDFG and ISADCB (IDFG 2006) and ISADCB and WS-Idaho (ISADCB 2011*a*) state that WS-Idaho is responsible for responding to complaints of bobcat predation on livestock and poultry and shall periodically notify the IDFG Regional Supervisor of the affected region of areas of suspected depredations. Regulated sport hunting and trapping of bobcats by the public in Idaho is allowed by the Idaho Fish and Game Commission with seasons normally opening in mid-December through mid-February of each year, with no limit on take. However, bobcats taken by trapping or hunting must comply with an IDFG mandatory check, report and pelt tag requirements and all other applicable regulations.

Bobcats are found in much of North America, excluding Alaska, most of Canada and the East- central United States, but are most abundant in western States. They are typically associated with rocky and chaparral habitat, but can be found in other habitats such as forests. They are found statewide in Idaho and IDFG trapping and hunting records indicate that higher densities are from Southwest, Clearwater and Panhandle regions (IDFG 2011*a*). Bobcats reach reproductive maturity at approximately 9 to 12 months of age and may have one to six kittens following a two-month gestation period (Crowe 1975, Koehler 1987). They may live up to 14 years, but annual mortality is as high as 47% (Rolley 1985).

Feral Cat. WS-Idaho periodically removes feral cats in PDM activities. Feral cats are fairly common throughout Idaho, particularly in rural areas. They are considered domestic animals and not wildlife. Complaints involving feral cats are most commonly received when they prey on poultry and small native wildlife species (i.e., nesting waterfowl and upland game birds). Primary responsibility for feral cat control rests with County and local authorities. WS-Idaho responds to requests from these entities as well as State and county Health Departments. WS-Idaho personnel are authorized to control feral cats to protect livestock, poultry, natural resources and human health and safety when requested by the sheriff or other authority.

Spotted Skunk. IDFG classifies spotted skunks as "Unprotected" and "Predatory Wildlife" in Idaho (Idaho Statute 36-201). As such, they can be taken in any amount and at any time by holders of the appropriate valid Idaho hunting, trapping or combination hunting license, provided such taking is not in violation of State, county or city laws, ordinances or regulations. IDFG oversees spotted skunk management, preservation and protection; however, the ISADCB is responsible for prevention and control of damage caused by predatory wildlife. That responsibility is delegated to WS-Idaho by way of an MOU dated February 3, 2011 (ISADCB 2011*a*). Spotted skunks are found throughout much of the continental U.S. including Idaho, with the exception of Bonneville, Boundary, Clark, Fremont, Madison and Teton Counties (Howard and Marsh 1982). They can be found in a wide variety of habitats, but primarily brushy or sparsely wooded areas to deserts. Damage caused by this species is similar to striped skunks, but is less frequently reported.

Weasel. IDFG classifies long-tailed and short-tailed weasels as "Unprotected" and "Predatory Wildlife" (Idaho Statute 36-201). As such, they can be taken in any amount and at any time by holders of the appropriate valid Idaho hunting, trapping or combination hunting license, provided such taking is not in violation of State, county or city laws, ordinances or regulations. IDFG oversees spotted skunk management, preservation and protection; however, the ISADCB is responsible for prevention and control of damage caused by predatory wildlife. That responsibility is delegated to WS-Idaho by way of an MOU dated February 3, 2011 (ISADCB 2011*a*).

The long-tailed weasel occurs from southern Canada to northern South America, with the exception of the southwest desert areas of the United States and the Baja California peninsula (Svendsen 1982). It inhabits all life zones from alpine-arctic to tropical, except for deserts, with favored habitats including brushland and open timber, brushy fields borders, grasslands along creeks and lakes and swamps (Svendsen 1982). They are distributed throughout Idaho. Short-tailed weasels are boreal, circumpolar species having the most widespread distribution of any species in the family Mustelidae (Svendsen 1982). It occupies a variety of boreal habitats from agricultural lowlands, woodlands and meadows, to montane habitats at elevations of 3,000-4,000 m (9,842-13,123 feet) (Svendsen 1982). It can be found in all of Canada and Alaska and in the Rocky Mountain States, including Idaho. WS-Idaho receive a small number of damage complaints for weasels, almost always for poultry predation.

Mink. IDFG classifies mink in Idaho as a furbearer and the IDFG is responsible for overseeing management of this species, including depredations. However, MOUs between IDFG and ISADCB (IDFG 2006) and ISADCB and WS-Idaho (ISADCB 2011*a*) state that WS-Idaho can respond to mink depredation and assist with PDM activities after notifying the IDFG of the situation. Regulated sport trapping of mink is allowed by the Idaho Fish and Game Commission with seasons normally opening November 1 through March 31 of each year, without a limit on take.

Mink are distributed throughout most of northern North America and throughout Idaho. They are mostly found in moderate, but stable populations and associated with lakes, streams and other wetlands where they feed on small mammals, birds, eggs, fish, insects and amphibians. Damage complaints for mink are rare and usually related to poultry depredation.

Common Raven. The raven is a nongame migratory bird managed by the USFWS under the Migratory Bird Treaty Act (MBTA). WS-Idaho responds to requests from livestock operators and others who experience depredation problems from ravens and works closely with USFWS to resolve damage complaints. See Section 1.3.2 for more information on WS-Idaho's authority to deal with damage caused by migratory birds. Raven depredation problems are mostly related to calving and lambing periods. Ravens, though, can cause a wide variety of damage in Idaho including: egg and young bird predation on upland game bird species, such as sage-grouse (Coates 2007), other wildlife and pets; damage to crops, property, fodder and silage bags and livestock feed; and threats to human health and safety such as damage associated with the juxtaposition of landfills with airports (i.e., aviation safety).

The raven is widely distributed throughout the northern hemisphere of the world including Europe, Asia and North America and extends well into Central America (Goodwin 1986). Ravens generally are a resident species, but some wandering and local migration occurs with immature and non-breeding birds (Goodwin 1986). Typical clutch size is between three and seven eggs. Immature birds, which have left their parents, form flocks with non-breeding adults. These flocks tend to roam and are loose-knit and straggling (Goodwin 1986). The raven is an omnivorous species known to feed on carrion, crops, eggs and birds, small mammals, amphibians, reptiles, fish and insects (Boarman and Heinrich 1999).

Black-billed Magpie. Black-billed magpies are protected as nongame migratory birds under the MBTA and managed by the USFWS; however, USFWS has issued a depredation order for magpies (50 CFR § 21.43) and does not require a federal permit to control magpies when found committing or about to commit depredations upon ornamental or shade trees, agricultural crops, livestock, or wildlife or when concentrated in such numbers and manner that they are a health hazard or other nuisance. WS-Idaho responds to requests from livestock operators and others who experience depredation problems from black-billed magpies. Magpie predation problems are primarily related to calving and lambing periods where they will peck at the eyes, nose, anus and other open-skinned areas of newly born calves and lambs. However, WS-Idaho has recorded other types of damage such as egg predation on ground nesting birds, predation on valuable leaf-cutter bee pupae and adults used as pollinators of alfalfa, seed crops and contamination of livestock feed through droppings.

Black-billed magpies are found in western North America from coastal and central Alaska to Saskatchewan, south to Texas, west to central California and east of the Sierra-Cascade range (Hall 1994). They migrate in winter to lower elevations and in northern parts of their range, south to areas within their breeding range (Hall 1994). They are opportunistic omnivores, eating insects, carrion, seeds, rodents, berries, nuts, eggs and also garbage and food from pets that are fed outside. Black-billed magpies can be found through Idaho, but preferred habitats include sagebrush and other open areas including foothills, agricultural lands and riparian groves below 8,000 feet in elevation.

American Crow. Crows are protected as nongame migratory birds under the MBTA and managed by the USFWS; however, USFWS has issued a depredation order on crows (50 CFR § 21.43) and does not require a federal permit to control crows when found committing or about to commit depredations upon ornamental or shade trees, agricultural crops, livestock, or wildlife or when concentrated in such numbers and manner that they are a health hazard or other nuisance. Additionally, crows are managed by the IDFG as small game with hunting seasons beginning in October 1 through January 31 of each year. There are no daily or possession limits. In some cases, crows have caused significant financial loss to agricultural crops (Simpson 1972, Salmon et al. 1986). Batterson and Morse (1948) identified crows as nest predators on sage-grouse in Oregon. In addition, crows are a major nest predator of other passerines and game birds (Parker 1984, Sugden and Beyersbergen 1986). In the Pacific Northwest, there is little doubt that crows have adapted well to urban life, with many cities supporting large crow populations (Angell 1978, Marzluff et al. 2001).

Crows are the most widespread corvid (crows, jays, ravens and magpies) in North America, ranging from the Yukon Territory, Canada, to Baja, California and the Gulf of Mexico and are found from the west coast to the east coast (Johnston 1961). They can be found throughout the year in Idaho (Roberts 1992) and in both rural and urban environments. Crows use a variety of natural and human-altered habitat types including rangelands, riparian woodlands (Knopf and Knopf 1983, Richards 1971), croplands, wetlands, fields, roadsides, pastures (Sullivan and Dinsmore 1992), beaches, shores of streams and lakes (Good 1952, Chamberlain-Auger et al. 1990), urban/suburban areas and golf courses (Chamberlain-Auger et al. 1990, Caffrey 1992). In general, crows thrive in areas of mixed habitat (open areas interspersed with woods) and thus have responded well to human-altered habitats (Marzluff et al. 2001). Johnston (1961) reported that crows reach their peak abundance in agricultural areas near wooded areas and crows have been highly successful at exploiting both agricultural and urban habitats (Marzluff et al. 1994).

Crows normally nest in loose colonies, construct a bowl-shaped stick nest that is placed high in trees and lay four to six bluish-green to greenish buff eggs with brown spots (National Audubon Society 1977). Sub-adult offspring from the previous years' brood help at the nest with feeding the young and with territory defense (Stokes and

Stokes 1996). From their spring nesting colonies or autumn and winter roosts, they forage for insects, grain, refuse and carrion.

Crow territories tend to be smaller in urban than in rural areas (Dickinson 1998) and are highly variable in size. Territory sizes range from 0.04 km^2 in suburban New York (Dickinson 1998) to 2.6 km^2 in a waterfowl breeding area of Manitoba (Sullivan and Dinsmore 1992). Caffrey (1992) reported an extremely high breeding density of 0.8 pairs/hectare (ha) on a golf course in Encino, California. This density may be explained by the abundant food and suitable nest sites (trees) available at this site. Emlen (1942) also documented high densities (111 nests in 44 ha) of nesting crows in a walnut orchard in California. In addition, Caffrey (1992) reported territories overlapped extensively and were not defended against conspecifics in southern California. However, in Florida, Kilham (1985) reported aggressive territorial defense during the breeding season. These observations suggest significant flexibility in territory use and defense. This complex territorial behavior is influenced by a number of factors including food availability, time of year and the relatedness of individuals and mating system.

Bald and Golden Eagles. Bald and golden eagles are provided federal protection under the Bald and Golden Eagle Protection Act and MBTA, which prohibit, except under specified permit conditions, the taking, possession, and commerce of such birds. WS works with the USFWS to insure compliance with laws and protections for eagles and, if necessary, would obtain the necessary authorizations when resolving human/eagle conflicts. U.S. Geological Survey, Breeding Bird Survey (BBS) population trend data (Sauer et al. 2014) indicate bald and golden eagle abundance is increasing in Idaho (Figure 4-1) and are increasing and stable, respectively, within USFWS Region 1. Bald eagle abundance has increased and populations have recovered to the point that the USFWS delisted the bald eagle from the ESA on August 8, 2007 (Federal Register 72:37346-37372).

Golden eagles are typically found in open mountainous or hilly terrain, where they hunt for small mammals, snakes, and carrion. Golden eagles will prey on lambs, kid goats, and other small livestock. They nest mostly on cliffs, but sometimes in trees and on power lines. To date, WS-Idaho has resolved all conflicts with golden eagles using technical assistance and/or nonlethal methods and does not anticipate using lethal methods to address conflicts with this species.

Bald eagle damage problems include killing livestock, causing damage at aquaculture facilities, and bird strike hazards at airports. They are common residents in Idaho, with increasing abundance (Sauer et al. 2014). WS-Idaho anticipates the only requests for assistance may involve damage to aquaculture facilities and a potential to cause aviation safety risks at airports. WS-Idaho has not attempted to take any bald eagles and will address all actions involving bald eagles with applicable nonlethal strategies to provide resolution to the conflict.

1.3.2 Authority for PDM in Idaho

With the exception of grizzly bears, feral and free-ranging dogs and cats, ravens, black-billed magpies and other migratory birds, the above species are primarily managed by the IDFG (See below regarding tribal wildlife management authority and rights). Idaho Statute 36-1109 states that "Prevention of depredation shall be a priority management objective of the department (IDFG) and it is the obligation of landowners to take all reasonable steps to prevent property loss from black bears or mountain lions or to mitigate damage by such." This statute further provides for monetary compensation to landowners suffering livestock depredations from black bear or mountain lion or when black bears damage berries or honey on private land. Damage must be confirmed by WS-Idaho and there is a $1,000 deductible per occurrence. Under Idaho Statute 36-1107, the Director of IDFG may authorize landowners or lessees to take any protected wildlife species causing damage to property. This law also authorizes livestock owners or their employees to take black bears or mountain lions that are molesting livestock without the need for any special permit or authorization.

On lands owned and managed by the tribes, primary management authority for wildlife, and feral and hybrid cats and dogs rests with the tribe, with the exception of species federally-listed under the ESA, and birds protected under the MBTA or the Bald and Golden Eagle Protection Act. Where provided for in treaties, tribes also retain rights to hunt fish and gather upon open and unclaimed lands. Tribal members continue, to this day, to exercise these treaty-reserved rights. Federal agencies have a duty to protect the lands, assets, and resources on which the tribe's treaty-reserved rights depend and to manage habitat to support populations necessary to sustain species hunted and gathered by tribal members. The trust duty also includes a procedural responsibility to meaningfully consult with tribes to determine when treaty resources are likely to be impacted by federal agency actions and work to avoid adverse impacts to treaty resources.

Establishment of the ISADCB was provided for under Idaho Statute 25-128. The Board is composed of the Chairman of the State Board of Sheep Commissioners, a representative of the Idaho Cattle Association, the Director of the Idaho State Department of Agriculture (ISDA), the Director of the IDFG and the Chairmen of the five ISADCB Districts in the State of Idaho. The Board is charged with coordinating and giving general direction to: "*Programs to prevent and control damage or conflicts on federal, State or other public or private lands caused by predatory animals, rodents or birds injurious to animal husbandry, agriculture, horticulture, forestry, wildlife and human health or safety* . . . " Under the provisions of an MOU between the IDFG and ISADCB (IDFG 2006), ISADCB is responsible for prevention and control of damage caused by predatory animals and other vertebrate pests, including T/E species within the State of Idaho as described in *Idaho Statute* Section 25-128. Additionally, an MOU signed February 3, 2011 between the ISADCB and WS-Idaho (ISADCB 2011*a*) delegates that responsibility to WS-Idaho.

Feral and free-ranging dogs and feral cats are managed under the authority of county and municipal laws. WS-Idaho responds to livestock and other animal depredation complaints involving feral and free-ranging dogs at the request of the County Sheriff. Responses to feral cat predation are normally conducted by WS-Idaho and reported to the County Sheriff's department or local authority when predation incidents are severe.

Ravens and black-billed magpies, as with other migratory birds, are managed by the USFWS. Under an MOU between the USFWS and WS, created under Executive Order 13186, WS has the responsibility of responding to migratory bird depredation complaints and provides USFWS with reports on activities involving ravens and other migratory birds (APHIS and USFWS 2012). WS-Idaho responds to routine migratory bird damage, other than eagles and T/E bird species, through a depredation permit issued by the USFWS. The MOU with the USFWS (APHIS and USFWS 2012) states that both parties "*Understand that non-target [unintentional] migratory birds might incidentally be killed despite the implementation of all reasonable measures to minimize the likelihood of take during actions covered under depredation permits, depredation and control orders, and agricultural control and eradication activities.*" WS agrees to "*obtain, as appropriate migratory bird depredation permits authorizing take necessary for wildlife damage management and identifying APHIS employees as the agents authorized to act under the permit authority. APHIS will develop guidance and procedures with the USFWS for minimizing such take (species and anticipated numbers) to resolve damage situations and develop procedures for review and evaluation of take actions.*" The term "take" is defined as "to pursue, hunt, shoot, wound, kill, trap, capture or collect or attempt to pursue, hunt, wound, kill, trap, capture or collect" (50 CFR § 10.12). The Executive Order further defines "take" to include intentional take, meaning that the take is the purpose of the activity in question and unintentional (incidental [non-target]) take is that which results from, but is not the purpose of, the activity in question. Intentional and unintentional take constitute take as defined by the MBTA. The regulations implementing the Bald and Golden Eagle Protection Act define take to mean "pursue, shoot, shoot at, poison, wound, killed, capture, trap, collect, destroy, molest or disturb bald and golden eagles" (50 CFR § 22.3). WS-Idaho's current USFWS Depredation Permit allows the take of up to 25 [individuals of bird] species except federal Birds of Conservation Concern, bald and golden eagles and T/E species. In addition, the permit allows the take of more than 25 individuals of bird species for certain birds (i.e., 200 Canada geese, 500 common ravens, etc.). However, should eagles or T/E bird species create severe depredation, WS-Idaho will work with the USFWS to address the problem, but would not conduct any PDM without USFWS authorization and a valid USFWS permit.

WS-Idaho has the lead in investigating and trapping grizzly bears involved in livestock depredation. The authority comes from a sub-permit issued by the USFWS, Grizzly Bear Recovery Coordinator and an MOU between IDFG and ISADCB (IDFG 2006).

1.4 RELATIONSHIP OF THIS ENVIRONMENTAL ASSESSMENT TO OTHER ENVIRONMENTAL DOCUMENTS

National Level Memoranda of Understanding with USFS and BLM. MOUs have been developed and signed between WS and BLM (completed August 29, 2012) and between WS and USFS (completed July 5, 2011) which coordinate wildlife damage management activities and related compliance with the NEPA on BLM and USFS lands.

Executive Order 13186 and MOU between USFWS and APHIS. Executive Order 13186 directs agencies to protect migratory birds and strengthen migratory bird conservation by identifying and implementing strategies that promote conservation and minimize the take of migratory birds through enhanced collaboration between agencies and American Indian tribes. A National-level MOU between the USFWS and APHIS was completed August 2, 2012 to facilitate the implementation of Executive Order 13186.

National Forest Land and Resource Management Plans (LRMP). The National Forest Management Act requires that each National Forest have an LRMP to guide long-term management and direction. WS-Idaho coordinates with the staff of each National Forest to assure that the EA is in conformance with the Forest Plan where WS-Idaho would potentially conduct PDM activities. Currently, WS-Idaho routinely conducts PDM activities on the Boise, Caribou-Targhee, Nez Perce-Clearwater, Payette, Salmon-Challis and Sawtooth National Forests and the Curlew National Grassland (Appendix B). WS-Idaho does not conduct any PDM activities on the Idaho Panhandle National Forest. However, if a request was received, WS-Idaho would consult with the appropriate USFS Forest Supervisor and staff to ensure consistency with the applicable Forest Plan.

BLM Resource Management Plans (RMP). The BLM currently uses RMPs to guide management actions for lands it administers, although a few areas operate under the older Management Framework Plans (MFPs) that are pending revision. There are four BLM District Offices in Idaho (Coeur d'Alene, Boise, Idaho Falls and Twin Falls). WS-Idaho coordinates with the BLM State Office to assure that the EA is in conformance with RMPs/MFPs as related to land management.

WS-Idaho EAs for Predator Damage Management. WS-Idaho currently has two PDM EAs that evaluate and guide PDM activities in the State. One EA, entitled "Predator Damage Management in Southern Idaho" was prepared in February 2002 and a Decision and FONSI was completed April 16, 2002. A Five-Year Review was prepared on this EA on May 18, 2007 and a new Decision and FONSI was issued April 2, 2008. The other PDM EA is entitled "Predator Damage Management in Northern and Central Idaho" and was prepared in September 1996. A Decision and FONSI was signed November 4, 1996 and a new Decision and FONSI was issued on October 2, 1997. A Supplement to the EA was prepared in 1999 with a Decision and FONSI issued August 6, 1999. Five-year Reviews were prepared in 2004 and 2009, and Decisions were issued and FONSIs signed November 4, 2004 and May 20, 2009, respectively.

This EA covers statewide PDM activities and analysis of impacts. Once completed, the final NEPA analysis and associated Decision (EA and FONSI or EIS and Record of Decision depending on the Decision resulting from this EA) will supersede the current PDM EAs and FONSIs.

IDFG Management Plans. The IDFG developed and adopted a policy in 2000 for avian and mammalian predation management (IDFG 2000). IDFG recognizes predator management to be a viable and legitimate wildlife management tool that must be available to wildlife managers when needed. The purpose of the Policy is to provide the IDFG direction in managing predator populations consistent with meeting management objectives for prey species populations. The Policy further states that predator populations, as with all wildlife in Idaho, will be managed to assure their future recreational, ecological, intrinsic, scientific and educational values and to limit conflicts with human enterprise and values. Where there is evidence that predation is a significant factor inhibiting the ability of a prey species to attain IDFG population management objectives and IDFG decides to implement predation management actions, the management actions will ordinarily be directed by a predation management plan. Additionally, in areas where survival or recruitment of game animal populations is chronically low and management plan objectives have not been or cannot be met and where there is evidence that predation is a significant factor, predator control may be initiated. Any decision made as a result of this EA process would be consistent with guidance in depredation management plans developed by IDFG.

Grizzly Bear Contingency Plan for the Caribou-Targhee National Forest. In 2011, the Caribou-Targhee National Forest prepared a grizzly bear contingency plan with the assistance of the IDFG, Wyoming Game and Fish Department, the USFWS and WS-Idaho. The purpose of the plan is to provide initial response guidance for grizzly bear incidents, including livestock depredation, on the Caribou-Targhee National Forest and outlines appropriate management actions to minimize and mitigate such incidents. The Plan states that WS-Idaho is responsible for minimizing livestock losses caused by predatory animals and provides assistance and control of grizzly bears when requested. Grizzly bear and livestock conflicts and management actions taken will emphasize safety and protection of humans, bears and property (livestock) and contribute towards conservation of grizzly bears in compliance with the Conservation Strategy Nuisance Grizzly Bear standards and the ESA.

EA – Bird Damage Management by WS-Idaho. In 1998, WS-Idaho completed an EA on alternatives for WS-Idaho involvement in bird damage management in the State. The EA was amended and new Decision/FONSIs were issued in 2003 and 2006. The EA included review of the potential environmental impacts of WS-Idaho actions to address damage by ravens, black-billed magpies and American crows that were not related to predation (e.g., risks to human health and safety and damage to property). Management of predation by crows, ravens and magpies was addressed in the two Idaho predator EAs (USDA 1996 and 2002a, as amended). All EAs considered the cumulative impacts of damage management actions involving these species that were conducted under the other EAs in the State. The majority of requests for assistance involving these species relates to predatory behavior. To simplify review of cumulative impacts, management of all types of damage caused by these species has been moved to this new EA on predator damage management in Idaho. The predator damage management EA, supersedes the review of raven, crow and magpie damage management in the bird damage management EA.

1.5 DECISIONS TO BE MADE

WS-Idaho is the lead agency for this EA and therefore responsible for the scope, content and decisions made. The IDFG is a cooperating agency in the preparation of this EA. WS-Idaho has also consulted with the BLM, USFWS, USFS, ISDA, United States Department of Energy-Idaho (DOE), IDL and the Shoshone-Bannock Tribes. The IDFG provided input and direction to WS-Idaho, assisted in developing the EA and helped review and address public comments. Each of the consulting agencies and tribes were asked to provide information on their concerns regarding PDM in Idaho and share information related to various aspects of PDM to ensure that program actions are in accordance with applicable regulations and policies and management plans. Based on the scope of this EA, the following decisions need to be made:

- Should PDM, as currently implemented, be continued in Idaho?

- If not, how can WS-Idaho best assist the agencies, tribes and the public with managing predator damage in Idaho?

- Would the alternative selected based on this analysis have significant impacts requiring preparation of an EIS?

1.6 SCOPE OF THIS ENVIRONMENTAL ASSESSMENT ANALYSIS

1.6.1 Actions Analyzed

This EA evaluates PDM to protect domestic animals (e.g., livestock and working animals) and other agricultural resources, crops, property, natural resources, and human health and safety in Idaho wherever such management is requested from WS-Idaho.

1.6.2 Native American Lands and Tribes

Decisions made in this EA would not regulate or restrict the PDM actions which may be taken by Native American tribes, but they would influence the types of assistance that WS-Idaho could provide to tribes. Invitations to participate as cooperating or consulting agencies and an offer to consult with the tribe on the actions proposed in this EA were sent to the leaders of the Coeur d'Alene Tribe, Kootenai Tribe of Idaho, Nez Perce Tribe, Shoshone-Bannock Tribes and Shoshone-Paiute Tribes. Only the Shoshone-Bannock Tribes responded to the invitation. The Nez Perce Tribe contacted WS-Idaho during the public comment period of the EA requesting consultation on WS PDM activities in Idaho. WS-Idaho has initiated consultation with the Tribe and is working to develop an ongoing system of reporting and consultation to address tribal concerns regarding PDM.

WS-Idaho would only conduct PDM on Native American tribal lands and lands held in trust by the United States Government upon the owner(s) request and in consultation with, or authorization by, the Bureau of Indian Affairs and the affected tribe(s). If PDM activities are requested on Native American lands, WS-Idaho would consult with the tribal government and/or the Bureau of Indian Affair's to determine the most appropriate action to take and methods to be used to efficiently resolve the problem while minimizing potential cultural resource conflicts.

1.6.3 Federal, State, County, Tribal and City Lands

There are about 33 million acres of federal lands and State-owned lands in Idaho, representing about 62% and 5%, respectively, of all lands in Idaho. See Section 2.1 for more information on land masses of the different federal, state, county and tribal land agencies and private property. Land mass owned by counties and cities is considerably less. WS-Idaho is often requested to conduct PDM on some of these lands. WS-Idaho coordinates with the applicable land management agency when conducting work on public lands (e.g., USFS or BLM). On city and tribal lands, WS-Idaho only conducts PDM actions with the authorization of applicable land managers and/or tribal leaders. (See Section 3.2.1).

1.6.4 Summary of Public Involvement

Issues and alternatives related to PDM as conducted by WS-Idaho were initially developed in consultation with IDFG, BLM, USFS, USFWS, IDFG, ISDA, DOE, IDL and Shoshone-Bannock Tribes. In addition, on December 12, 2014, WS-Idaho issued an invitation soliciting public comments on alternatives and issues to be addressed in the analysis through a notice posted in the APHIS Stakeholder Registry, the WS NEPA page, the federal e-rulemaking portal (Regulations.gov), a legal notice in The Idaho Statesman, direct mailings to the five federally recognized Native American tribes in Idaho and direct mailings to organizations and individuals in Idaho known to be interested in PDM.

As part of this process and as required by the Council on Environmental Quality (CEQ) and APHIS' NEPA implementing regulations, this document was made available to the public through the same processes used to solicit public comments on the issues and alternatives to be addressed in the EA. The public was informed of the availability of the EA for review and comment on June 19, 2015 through notices on the WS NEPA web site, Regulations.gov, and a legal notice in The Idaho Statesman requesting public review and comments on the analysis. WS-Idaho also sent out notices through the WS National Stakeholder email registry, direct emails to individuals who had participated in the scoping period for the EA or the prior supplement to the PDM EA for southern Idaho and conventional mailings. The comment period closed on July 27, 2015. During this comment period, WS-Idaho received 148 comment letters, plus some late comments and additional information well after the comment period closed which were also incorporated into this final EA. Through the public involvement process, WS-Idaho clearly communicated to the public and interested parties the analyses of potential environmental impacts on the quality of the human environment. New issues or alternatives raised after publication of public notices were fully considered to determine whether the EA should be revisited and, if appropriate, revised prior to issuance of a Decision. The final EA and Decision/FONSI will be released for public comment using the same methods used to make the EA available for public comment.

1.6.5 Period for Which This EA is Valid

If the analyses in the EA indicate an EIS is not warranted, then this EA would remain valid until WS-Idaho determines that new needs for action, new or different environmental issues or new alternatives have arisen that have different environmental effects and must be analyzed. At that time, this analysis and document may be supplemented pursuant to NEPA. This EA would be monitored to ensure that it is complete and still appropriate for the scope of PDM activities in Idaho.

1.6.6 Site Specificity

This EA analyzes potential impacts of PDM and addresses WS-Idaho PDM activities on all lands under Cooperative Service Agreement, Agreements for Control or Annual Work Plans (AWPs) within Idaho. It also addresses the impacts of PDM on areas where additional agreements with WS-Idaho may be written in the reasonably foreseeable future. Because the proposed action is to provide service when requested within the constraints of available funding and staffing, it is conceivable that additional PDM efforts could occur. Thus, this EA anticipates potential expansion and minor program changes and analyzes the impacts of such efforts as part of the current and proposed programs. This EA emphasizes substantive issues as they relate to specific areas whenever possible. However, the issues that pertain to predator damage and resulting management are the same, for the most part, wherever they occur and are treated as such. For example, the effects on social values or target species are evaluated wherever PDM actions may occur, potentially anywhere in the State. On the other hand, effects on T/E species can be more location specific (based on certain habitat types) and therefore, the analysis would be focused on PDM effects where a given T/E species may be found. The standard WS Decision Model (Chapter 3, Section 3.2.1, WS Directives 2.101 and 2.105) would be the site-specific procedure for determining methods and strategies to use or recommend for individual actions conducted by WS-Idaho. Decisions made using the model would be in accordance with standard operating procedures described herein and adopted or established as part of the decision.

1.7 AUTHORITY AND COMPLIANCE

1.7.1 Authority of Federal and State Agencies and Tribes

This section provides a description of state, federal, and tribal authorities and responsibilities. Appendix E provides additional information on how agencies interact relative to PDM.

Wildlife Services' Legislative Authority. The primary statutory authority for the WS program is the Act of March 2, 1931, as amended (7 U.S.C. § 426-426b), which provides that:

The Secretary of Agriculture is authorized and directed to conduct such investigations, experiments, and tests as he may deem necessary in order to determine, demonstrate, and promulgate the best methods of eradication, suppression, or bringing under control on national forests and other areas of the public domain as well as on State, Territory or privately owned lands of mountain lions, wolves, coyotes, bobcats, prairie dogs, gophers, ground squirrels, jackrabbits, brown tree snakes and other animals injurious to agriculture, horticulture, forestry, animal husbandry, wild game animals, furbearing animals, and birds, and for the protection of stock and other domestic animals through the suppression of rabies and tularemia in predatory or other wild animals; and to conduct campaigns for the destruction or control of such animals. Provided that in carrying out the provisions of this Section, the Secretary of Agriculture may cooperate with States, individuals, and public and private agencies, organizations, and institutions.

Since 1931, with changes in societal values, WS policies and programs place greater emphasis on the part of the Act discussing "bringing [damage] under control," rather than "eradication" and "suppression" of wildlife populations. In 1988, Congress strengthened the legislative authority of WS with the Rural Development, Agriculture, and Related Agencies Appropriations Act (Public Law 100-202, Dec. 22, 1987. Stat. 1329-1331 (7 U.S.C. § 426c)). This Act states, in part:

That hereafter, the Secretary of Agriculture is authorized, except for urban rodent control, to conduct activities and to enter into agreements with States, local jurisdictions, individuals, and public and private agencies, organizations, and institutions in the control of nuisance mammals and birds and those mammal and bird species that are reservoirs for zoonotic diseases, and to deposit any money collected under any such agreement into the appropriation accounts that incur the costs to be available immediately and to remain available until expended for Animal Damage Control activities.

WS is a cooperatively-funded, service-oriented federal agency that provides assistance to requesting public and private entities, and federal, State, county, local and tribal governments. WS responds to requests for assistance when valued resources are lost, damaged or threatened by wildlife. Responses can be in the form of providing technical assistance or direct PDM. The degree of WS' involvement varies, depending on the complexity of the wildlife problem and authorities.

WS mission, developed through a strategic planning process, is: 1) "To provide leadership in wildlife damage management in the protection of America's agricultural, industrial and natural resources, and 2) to safeguard public health and safety." This is accomplished through:

A) Training of wildlife damage management professionals;
B) development and improvement of strategies to reduce economic losses and threats to humans from wildlife;

C) collection, evaluation and dissemination of management information;
D) cooperative wildlife damage management programs;
E) informing and educating the public on how to reduce wildlife damage; and,
F) providing technical advice and a source for limited-use management materials and equipment such as pesticides, cage traps and pyrotechnics.

WS Policy Manual reflects the mission and provides guidance for engaging in PDM activities. WS personnel abide by WS mission and national policies. WS' activities are conducted in accordance with applicable federal, State and local laws. Prior to PDM being conducted, an Agreement for Control must be signed by the applicable WS State Office and the land owner or manager; a cooperative service agreement developed and signed; an AWP is prepared and provided to the land management administrator or agency representative for their review; or MOUs are developed between WS and other agencies at the local and national levels. These documents establish the need for the requested work, legal authorities allowing the requested work, and the responsibilities of WS, WS-Idaho and its cooperators.

Idaho State Animal Damage Control Board (ISADCB). Establishment of the ISADCB was provided for under *Idaho Statute* 25-128. The ISADCB is composed of the Chairman of the State Board of Sheep Commissioners, a representative of the Idaho Cattle Association, the Director of the ISDA, the Director of the IDFG and the Chairmen of the five ISADCB Districts in the State of Idaho. The Board is charged with coordinating and giving general direction to "*Programs to prevent and control damage or conflicts on federal, State, or other public or private lands caused by predatory animals, rodents, or birds injurious to animal husbandry, agriculture, horticulture, forestry, wildlife and human health or safety* . . ."

Under the provisions of an MOU between the ISADCB and WS-Idaho, WS-Idaho cooperates with carrying out wildlife damage management in Idaho (ISADCB and WS 2011).

Idaho Department of Fish and Game. In Idaho, management of all wildlife species (with the exception of T/E species, most migratory birds and eagles) is the responsibility of the IDFG. However, prevention and control of damage caused from some predatory big game and furbearer species and Unprotected and Predatory Wildlife is the responsibility of the ISADCB. That responsibility is delegated to WS-Idaho by way of an MOU dated February 3, 2011 (ISADCB 2011*a*). Idaho Statute 36-1109 states that "Prevention of depredation shall be a priority management objective of the department [IDFG], and it is the obligation of landowners to take all reasonable steps to prevent property loss from black bears, grizzly bears or mountain lions or to mitigate damage by such." This statute further provides for monetary compensation to landowners suffering livestock depredations from black bear or mountain lion or when black bears damage berries or honey on private land. Damage must be confirmed by WS-Idaho and there is a $1,000 annual deductible.

Under *Idaho Statute* 36-1107(b), the Director of IDFG may authorize landowners or lessees to take any protected wildlife species causing damage to property. This law also authorizes livestock owners, their employees, agents and animal damage control [e.g., WS-Idaho with appropriate cooperative service agreements] to take black bears, mountain lions and predators that are molesting or attacking livestock without the need for any special permit or authorization.

Idaho State Department of Agriculture. Under the provisions of *Idaho Statute* 22-103(22), the Director of the ISDA is authorized, "*To take all steps that are deemed necessary to prevent and control damage or conflicts on federal, State, or other public or private lands caused by predatory animals, rodents, or birds, including threatened or endangered wildlife within the State of Idaho as are established by federal or State law, federal or State regulation, or county ordinance, that are injurious to animal husbandry, agriculture, horticulture, forestry, wildlife and human health and safety.*" Under *Idaho Statute* 22-102A, the ISDA is also responsible for issuance of private aerial hunting permits for PDM.

U.S. Fish and Wildlife Service. The USFWS has the responsibility to manage migratory birds including the common raven and T/E species and evaluates the need for action and effects on ravens and other migratory birds before issuing any permits, including depredation or scientific collecting permits. All raven and other migratory bird take in Idaho is conducted in accordance with permit restrictions and conditions as issued by the USFWS.

WS-Idaho consults with USFWS on its potential program effects on T/E species from PDM activities. No action occurs without either a determination that the program would have no effect on T/E species, a concurrence from USFWS that the program would not be likely to adversely affect T/E species or a USFWS formal Biological Opinion with reasonable and prudent measures, if necessary, to ensure that WS-Idaho would not jeopardize the continued existence of T/E species in Idaho.

U.S. Forest Service and Bureau of Land Management. The USFS and BLM have the responsibility to manage the resources of federal National Forests and public lands for multiple-use including livestock grazing, timber production, recreation and wildlife habitat; while recognizing the State's authority to manage resident wildlife populations. Both USFS and 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 National MOUs (BLM MOU WO-230-2012-05; FS MOU 11-SU- 11132422-151) with WS to facilitate a cooperative relationship. Both federal land management agencies recognize WS's expertise in wildlife damage management and rely on WS at the State-level to determine livestock and other resource losses and the appropriate methodologies for conducting PDM. WS-Idaho's PDM activities are conducted in compliance with USFS and BLM Land Use Plans, Travel Management Plans and the

Federal Land Policy Management Act (Public Law 94-579) and other federal regulations.

Native American Tribes. The United States and all its agencies, as fiduciaries, owe a trust duty to the Native American tribes. This duty includes a substantive duty to protect—to the fullest extent possible—the lands, assets, and resources on which the tribe's treaty-reserved rights depend and to manage habitat to support populations necessary to sustain species hunted and gathered by tribal members. The trust duty also includes a procedural responsibility to meaningfully consult with the tribes to determine when treaty resources are likely to be impacted by federal agency actions and to avoid adverse impacts to treaty resources. According to the President's April 29, 1994 memorandum regarding Government-to-Government Relations with Native American Tribal Governments, federal agencies "shall assess the impacts of Federal Government plans, projects, programs, and activities on tribal trust resources and assure that tribal government rights and concerns are considered during the development of such plans, projects, programs, and activities." Executive Order 13175 further provides that each "agency [within the federal government] shall have an accountable process to ensure meaningful and timely input by tribal officials in the development of regulatory policies that have tribal implications." The Nez Perce Tribe and Shoshone-Bannock Tribes have an ongoing consultation with WS-Idaho on issues specific to this analysis.

<u>Nez Perce Tribe</u>: Since time immemorial, the Nez Perce Tribe has used and occupied the lands and waters of north-central Idaho, southeastern Washington, northeastern Oregon, and areas of Montana for subsistence, ceremonial, commercial, and religious purposes. In 1855, the United States negotiated a treaty with the Tribe. Treaty of June 9, 1855, with the Nez Perce, 12 Stat. 957 (1859). In Article 3 of this treaty, the Tribe explicitly reserved to itself certain rights, including "the exclusive right to take fish in streams running through or bordering the Reservation," "the right to take fish at all usual and accustomed places in common with citizens of the Territory; and of erecting temporary buildings for curing, together with the privilege of hunting, gathering roots and berries, and pasturing their horses and cattle upon open and unclaimed lands." Tribal members continue, to this day, to exercise these treaty-reserved rights—including the right to hunt culturally significant species on open and unclaimed lands—for subsistence, cultural, religious, and economic purposes.

The Nez Perce Tribe's Chairman, the Nez Perce Tribal Executive Committee, and authorized staff have been delegated the authority to represent the Tribe in the management of the treaty and trust resources and to work as a cooperative government in the initiation, development, and implementation of federal policy and management decisions that potentially impact the sovereign and other rights of the Tribe. The Tribe has substantial wildlife management expertise and works with federal land managers through staff-to-staff and government-to-government consultation.

Shoshone-Bannock Tribes: The Fort Hall Reservation is located in the eastern Snake River Plain of southeastern Idaho. It is comprised of lands that lie north and west of the town of Pocatello. The Snake River, Blackfoot River, and the American Falls Reservoir border the reservation on the north and northwest. The reservation was originally established by an Executive Order under the terms of the Fort Bridger Treaty of 1868 and was subsequently modified in legislation and the allotment process. The 1868 Fort Bridger Treaty, between the United States and the Shoshone and Bannock Tribes also reserves the Tribes' right to hunt, fish, gather, and exercise other traditional uses and practices on unoccupied federal lands within ceded territory. In addition to these rights, the Shoshone Bannock have the right to graze tribal livestock and cut timber for tribal use on those lands of the original Fort Hall Reservation that were ceded to the federal government under the Agreement of February 5, 1898, ratified by the Act of June 6, 1900.

The Tribes are governed by the Fort Hall Business Council that is comprised of seven members. The council is elected by the general membership for two-year terms. The Council maintains authority over all normal business procedures, including the development of lands and resources and all matters of self-government. The Tribes' Fish & Wildlife Department mission is to protect, restore, and enhance fish and wildlife related resources in accordance with the Tribes' unique interests and vested rights in such resources and their habitats, including the inherent, aboriginal and treaty protected rights of tribal members to fair process and the priority rights to harvest pursuant to the Fort Bridger Treaty of July 3, 1868.

1.7.2 Compliance with Federal Authorities

There are several federal laws, policies and Executive Orders that authorize, regulate or otherwise affect WS-Idaho PDM activities. WS-Idaho complies with these authorities and consults and cooperates with other agencies as appropriate.

National Environmental Policy Act (NEPA) (42 U.S.C. §§ 4321 et seq.). The NEPA incorporates environmental planning and public involvement into federal agency planning and decision-making processes. Unless an action is exempted from compliance with the NEPA, agencies must have available and fully consider detailed information regarding the potential environmental effects of their actions at the time the management decision is made and agencies must make this information available to interested and/or affected persons, agencies and organizations before decisions are made and actions are taken. WS and WS-Idaho follow the Council for Environmental Quality (CEQ) regulations implementing NEPA (40 CFR 1500 *et seq.*), as well as USDA (7 CFR 1b) and the APHIS' NEPA implementing regulations (7 CFR Part 372) as a part of the decision-making process. NEPA 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.

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

Migratory Bird Treaty Act of 1918 (16 U.S.C. §§ 703-711), as amended. The MBTA provides the USFWS regulatory authority to protect species of birds that migrate outside the United States and prohibits any take of such birds except as permitted by the USFWS. WS-Idaho receives annual authorization from the USFWS to take migratory birds that are causing damage or depredation problems. Executive Order 13186, and the subsequent MOUs between FWS and federal agencies, provide additional measures for strengthening the conservation of migratory birds. WS may take migratory birds under depredation or scientific collecting permits issued directly to WS State Directors or as the designated agent of an individual with a scientific collecting permit when so designated on the permit.

Bald and Golden Eagle Protection Act (16 U.S.C. §§ 668-668c). In addition to the protections afforded by the Migratory Bird Treaty Act, this law provides further protection for bald and golden eagles. Similar to the Migratory Bird Treaty Act, it prohibits any "*take*" of these species, except as permitted by the USFWS. The Act, through a USFWS permitting process (50 CFR 22.26), authorizes take of bald and golden eagles where it is compatible with the preservation of eagles; necessary to protect an interest in a particular locality; associated with but not the purpose of the activity; and where the take cannot practicably be avoided or is unavoidable even though advanced conservation practices are being implemented.

Endangered Species Act (ESA). The ESA requires that all federal agencies seek to conserve T/E species and utilize their authorities in furtherance of the purposes of the Act (Section 2(c)). WS-Idaho conducts consultations with the USFWS, as required by Section 7 of the ESA, to use the expertise and experience of the USFWS, to ensure that "*any action authorized, funded or carried out by such an agency...is not likely to jeopardize the continued existence of any endangered species or threatened species.*" (Sec. 7(a)(2)). WS-Idaho has conducted local informal and formal consultations and conferences with USFWS for all WS-Idaho wildlife damage management activities including the proposed PDM program. When this EA on predator damage management was made available for public comment, it referenced a Section 7 consultation and conference between WS-Idaho and the USFWS on all WS-Idaho activities that was completed on July 1, 2014. A new consultation updating the July 1, 2014 Biological and Conference Opinion with the USFWS was completed on May 13, 2016 with the issuance of a Biological Opinion by the USFWS. Changes from the new consultation have been incorporated into this final PDM EA. Although the updated consultation included additional measures for the protection of T/E species and updated data, it did not substantively change the determinations regarding impacts of WS-Idaho activities on listed species in the State.

The July 1, 2014 biological and conference opinion considered potential impacts to wolverine from WS-Idaho's PDM methods. The May 13, 2016 consultation was completed after the USFWS had determined that listing of wolverines was not warranted and did not include review of potential impacts to wolverines. On April 4, 2016, the federal courts reversed the USFWS decision and wolverines have been returned to their previous status as a proposed threatened species. WS-Idaho has initiated a supplement to the May 13, 2016 consultation with the USFWS on June 17, 2016 regarding potential impacts to this species. There has not been a conclusion reached by the USFWS regarding the potential impacts to wolverine. Until their determination is reached, WS-Idaho will continue to operate under the July 1, 2014 Biological and Conference Opinion as it pertains to wolverines and as provided in the original PDM EA that was made available for public comment. Appropriate changes will be made when the final decision is received from the USFWS if they differ from that earlier biological and conference opinion (See Section 4.2.1.2).

Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). The FIFRA requires the registration, classification and regulation of all pesticides used in the United States. All pesticides used or recommended by WS-Idaho are registered with and regulated by the Environmental Protection Agency (EPA) and ISDA. All pesticide use by WS-Idaho is carried out in compliance to labeling procedures and requirements as regulated by EPA and ISDA.

Fish and Wildlife Act of 1956 (16 U.S.C. § 742j-1) Airborne Hunting. This Act, amended in 1971, was added to the Fish and Wildlife Act of 1956 and is commonly referred to as the Airborne Hunting Act. The Act allows the following exemption to the general prohibition against the shooting of wildlife from an aircraft: "*This section shall not apply to any person if such person is employed by, or is an authorized agent of or is operating under a license or permit of, any State or the United States to administer or protect or aid in the administration or protection of land, water, wildlife, livestock, domesticated animals, human life, or crops, and each such person so operating under a license or permit shall report to the applicable issuing authority each calendar quarter the number and type of animals so taken.*" The USFWS regulates the Airborne Hunting Act but has delegated implementation to the States. In Idaho, the ISADCB issues permits to private individuals for aerial hunting. WS-Idaho is not required to be permitted by ISADCB or federal law (16 U.S.C. § 742j-1) before conducting aerial shooting activities.

National Historic Preservation Act of 1966, as amended (NHPA). The NHPA (16 U.S.C. § 470), as amended, and its implementing regulations (CFR 36, 800) require federal agencies to: 1) determine whether proposed activities constitute "undertakings" that can result in changes in the character or use of historic properties; 2) if so, to evaluate the effects of such undertakings on such historic resources and consult with the State Historic Preservation Office regarding the value and management of specific cultural, archaeological and historic resources; and 3) consult with appropriate American Indian tribes to determine whether they have concerns for traditional cultural properties in areas of these federal undertakings.

The Wild Horse and Burro Act of 1971. The Wild Horse and Burro Act of 1971 (Public Law 92-195), as amended by The Federal Land Policy and Management Act of 1996 (Public Law 94-579) and The Public Rangelands Improvement Act of 1978 (Public Law 95-514), requires BLM and USFS to manage wild horse and burro herds at population levels that preserve and maintain a thriving natural ecological balance on areas that they roam.

Executive Order 13186 and MOU between USFWS and APHIS. Executive Order 13186 directs agencies to protect migratory birds and strengthen migratory bird conservation by identifying and implementing strategies that promote conservation and minimize the take of migratory birds through enhanced collaboration between agencies and American Indian tribes. A National-level MOU between the USFWS and APHIS was completed August 2, 2012, to facilitate the implementation of Executive Order 13186.

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

Native American Graves Protection and Repatriation Act. The Native American Graves and Repatriation Act of 1990 provides protection of American Indian burials and establishes procedures for notifying tribes of any new discoveries. Senate Bill 61, signed in 1992, sets similar requirements for burial protection and tribal notification with respect to American Indian burials discovered on State and private lands. If a burial site is located by a WS-Idaho employee, the appropriate tribe would be notified. PDM activities on tribal lands would only be conducted at the request of a tribe and, therefore, the tribe would have ample opportunity to discuss cultural and archeological concerns with WS-Idaho. In addition, in consideration of Idaho's Native American tribes, WS-Idaho has reached out to all federally-recognized tribes in Idaho to solicit their comments on this EA.

The Wilderness Act (16 U.S.C. §§ 1131-1136). The Wilderness Act established a national preservation system to protect areas *"where the earth and its community life are untrammeled by man"* for the United States. Wilderness Areas (WAs) are devoted to the public for recreational, scenic, scientific, educational, conservation and historical use. Section 4(d)(4)(2)(4) - Water Resources and Grazing states, "Within wilderness areas in the national forests designated by this Act, … (2) the grazing of livestock, where established prior to September 3, 1964, shall be permitted to continue subject to such reasonable regulations as are deemed necessary by the Secretary of Agriculture." The Act leaves management authority for fish and wildlife in WAs with the State for those species under their jurisdiction. Some portions of WAs in Idaho have historic grazing allotments and permittees could request WS-Idaho assistance with PDM. WS-Idaho has not conducted PDM in WAs for the protection of livestock and other resources within the last 5 or more years, but limited work could be conducted in the future if a request is received (Appendix B, Section 4.2.1.3). As future requests are received to conduct PDM in WAs, WS-Idaho will continue to consult with the appropriate federal land management agency to ensure activities are in compliance with the Act.

Environmental Justice and Executive Order 12898 Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations. Environmental Justice has been defined as the pursuit of equal justice and equal 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. A critical goal of Executive Order 12898 is to improve the scientific basis for decision-making by conducting assessments that identify and prioritize environmental health risks and procedures for risk reduction. Environmental Justice is a priority within USDA, APHIS and WS. APHIS plans to implement Executive Order 12898 principally through its compliance with the provisions of NEPA.

WS-Idaho activities are evaluated for their impact on the human environment and compliance with Executive Order 12898 to ensure Environmental Justice and implement PDM methods as selectively and environmentally conscientiously as possible. All chemicals used by WS-Idaho are regulated by the EPA through FIFRA, ISDA, by MOUs with federal land management agencies and by WS Directives. WS-Idaho properly disposes of any excess solid or hazardous waste. It is not anticipated that the proposed action would result in any adverse or disproportionate environmental impacts to minority and low-income persons or populations.

WS-Idaho is establishing a system of regular consultation with the Nez Perce Tribe to address a range of issues including ways to minimize potential risks to traditional uses of natural resources and ecosystems including subsistence and ceremonial hunting and gathering opportunities from WS-Idaho activities. Similar consultations may be conducted with other federally recognized tribes at the tribe's request.

Idaho Animal Control Laws. In Idaho, enforcement of dog and cat control laws is the responsibility of local governmental agencies. County or municipal animal control officials or County Sheriff Departments are responsible for responding to feral, hybrid or stray dogs and cats that threaten, injure or kill livestock or damage property. WS-Idaho policy provides guidance to personnel when they are requested by these agencies to assist with feral and free-ranging dog and feral cat control. Any involvement by WS-Idaho in dog and cat damage management is upon approval of the State Director. When a request is received from IDFG or other natural resource management agencies to direct PDM activities towards feral and free-ranging dogs; and feral cats to protect wildlife or other natural resources, WS-Idaho coordinates with the local Sheriff Departments to inform them of our intentions, the location and any other particulars as deemed necessary to foster communication.

CHAPTER 2. ISSUES AND AFFECTED ENVIRONMENT

2.0 INTRODUCTION

Chapter 2 contains a discussion of the issues relevant to making informed decisions regarding WS-Idaho involvement in PDM in Idaho, including those that receive detailed environmental impacts analysis in Chapter 4 (Section 4.2), those used to develop standard operating procedures (Sections 2.2 and 3.4) and those that are not considered in detail with rationale (Section 2.3). Pertinent portions of the affected environment are included in this Chapter in the discussion of issues to be addressed in detail. Additional information on the affected environment is provided in the Chapter 1 sections on the need for action and background information, and in the Chapter 4 analysis of the impacts for each of the alternatives.

2.1 AFFECTED ENVIRONMENT

Idaho encompasses approximately 83,557 square miles (≈ 53.5 million acres) and is comprised of 44 counties. WS-Idaho personnel receive requests to conduct PDM throughout the various counties on private, federal, State, tribal, county and municipal lands. Of the total acreage in Idaho, about 33 million acres (62%) are federally managed lands. The USFS manages about 20 million acres; 12 million acres are managed by the BLM; and about 1 million acres are managed by other federal agencies. There are about 2.8 million acres total, owned and managed by state agencies (i.e., IDL, IDFG, etc.); tribal lands consist of about 650,000 acres; and privately-owned lands consist of about 17 million acres. Native American tribes such as the Nez Perce and Shoshone-Bannock Tribes have rights to hunt, fish and gather, graze livestock, and exercise other traditional uses and practices on unoccupied federal lands within ceded territories defined in Treaties between the U.S. government and the tribes.

The majority of federal property having AWPs for PDM is under term grazing permits or grazing leases from the BLM and USFS. As of May 30, 2014, WS-Idaho has cooperative service agreements and AWPs in place to work on approximately 18.6 million acres, or about 35% of the State's total acreage (MIS 2014). WS-Idaho typically only works on about 33% (MIS 2014) of all lands under agreements and where AWPs are in place every year (about 11.6% of all lands in Idaho, or about 6.2 million acres) and of those lands, actual PDM activities occur on only about 50% (<5.8% of all lands in Idaho, or about 3.1 million acres) of those total land masses. The program does not work continuously throughout the year on most of the properties and only works on a very small percentage of the total numbers of acres for each property under agreement or having AWPs. Additionally, WS-Idaho typically spends only a few hours or days on any specific property during the year resolving damage problems.

During FY 2013, WS-Idaho conducted PDM on properties totaling approximately 6.2 million acres (about 11.6% of all lands in Idaho and about 33% of all lands that WS-Idaho have under signed agreements or have established AWPs) where target predators potentially were taken (MIS 2014). Of the 6.2 million acres, about 2.6 million acres were on BLM lands (about 22% of the total BLM lands in Idaho); 1.4 million acres of USFS lands (about 7% of all USFS lands in Idaho); 252,880 acres of "other" federally-owned/managed lands (about 25% of "other" federally-owned/managed lands in Idaho); 103,885 acres of State lands (3.7% of all Idaho State lands); 1.8 million acres on private property (about 10.6% of all private lands in Idaho); and 25,000 acres of tribal lands (or about 3.8% of all tribal lands in Idaho). A summary of federal public lands in Idaho, the probability that PDM may be conducted on those lands under the current program, and the types of tools which may be used are provided in Appendix B.

2.2 ISSUES EVALUATED IN DETAIL

The following environmental issues are evaluated for each alternative presented in this EA. The issues have been identified through interagency planning and coordination, and prior NEPA compliance processes in Idaho. These issues are defined in Section 2.2.1 and are evaluated under each alternative in Chapter 4, Environmental Consequences.

- Effects on Target Predator Species Populations
- Effects on Non-target Species Populations, Including T/E Species
- Impacts on Special Management Areas (SMAs) (e.g., designated wilderness areas)
- Humaneness and Ethical Perspectives
- Cultural Impacts including impacts on Native American Cultural Uses, Hunting, Non-Consumptive Uses, and Aesthetic Impacts
- Impacts on Public and Pet Safety and the Environment
- Cost Effectiveness
- Indirect and Cumulative Impacts

2.2.1 Effects on Target Predator Species Populations

Maintaining viable populations of all species is a concern of the public and of biologists within the State and federal land and wildlife management agencies, including WS-Idaho. This Section addresses concerns that WS-Idaho PDM would adversely affect populations of target species for each of the alternatives. For purposes of this EA, target species are primarily coyotes, badgers, black bears, mountain lions, striped skunks and ravens.

2.2.2 Effects on Non-target Species Populations, Including T/E Species

A common concern among members of the public and wildlife professionals, including WS-Idaho personnel, is the possible impact of PDM control methods and activities on non-target species, particularly T/E species, species of special concern and rare and declining species. The use of nonlethal and lethal methods has the potential to inadvertently disperse, capture or kill non- target wildlife. To reduce the risks of adverse effects to non-target wildlife, WS-Idaho would select damage management methods that are as target-selective as possible or apply such methods in ways to reduce the likelihood of capturing or otherwise adversely impacting non-target species. Standard Operating Procedures (SOPs) implemented by WS-Idaho help to reduce the effects of PDM on non-target species populations and are presented in Chapter 3.

This Section also addresses concerns that WS-Idaho's activities could result in the disturbance, injury or death of eagles that may be near or within the vicinity of WS-Idaho's activities. Under 50 CFR 22.3, the term "*disturb*", as it relates to take under the Bald and Golden Eagle Act, has been defined as "*to agitate or bother a Bald and Golden Eagles to a degree that causes, or is likely to cause, based on the best scientific information available, 1) injury to an eagle, 2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or 3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior.*"

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- Idaho completed a Section 7 consultation with the USFWS to ensure compliance with the ESA and to ensure that the proposed management actions are not likely to jeopardize the continued existence of any endangered or threatened species (USDA 2013*a*). Special efforts are made to avoid jeopardizing T/E species through biological evaluations of the potential effects and the establishment of special restrictions or minimization measures. Applicable SOPs and other measures for the protection of State and federally-listed species are presented in Chapter 3 and discussed in Chapter 4 of this EA.

Agencies, tribes and the public are also concerned about the potential for indirect impacts on non-target species and ecosystems that could occur as a result of changes in predator populations caused by use of some PDM actions. Concerns related to this issue include the potential for WS actions to impact trophic cascades, biodiversity, and ecosystem resilience (Sections 4.2.1.2, 4.2.2.2, 4.2.3.2, 4.2.4.2 and 4.2.5.2). An example of the type of issue addressed in this Section is the concern that WS-Idaho actions to reduce one predator species (e.g., coyotes) to result in increases in other smaller predator species populations (e.g., red fox) and cause indirect adverse impacts on prey populations such as ground nesting birds.

2.2.3 Impacts on Special Management Areas (SMAs)

Special Management Areas are established by land management agencies to set aside lands for a specific purpose (e.g., habitat management for a T/E species) or to preserve the characteristics of a site until a formal management decision regarding the site's future management can be made. These areas may have special restrictions on the types of activities which may be conducted in the area. The effect of the alternatives on SMAs and mechanisms for ensuring that PDM actions are consistent with the purpose of SMAs such as WSAs (Wilderness Study Areas) is discussed.

2.2.4 Humaneness and Ethical Perspectives

Many people are concerned with the humane treatment of animals. The issue of humaneness and other sociological issues including ethical perceptions pertaining to PDM can be interpreted in a variety of ways depending upon individual perspectives, philosophies and experience. This Section reviews the varying perspectives on this issue relative to the proposed management actions for each alternative. Factors considered in this Section include review of Native American values relative to natural resources and the environment and cultural practices.

2.2.5 Cultural Impacts including impacts on Native American Cultural Uses, Hunting, Non-Consumptive Uses, and Aesthetic Impacts

Some members of the public may be concerned that WS-Idaho PDM activities could conflict with recreational activities such as hunting and fishing and non-consumptive uses, such as wildlife viewing and photography.

Aesthetics is a philosophy dealing with the nature of beauty or the appreciation of beauty. Therefore, aesthetics is subjective in nature and is dependent on what an observer regards as beautiful. Wildlife generally is regarded as providing economic, recreational and aesthetic benefits (Decker and Goff 1987) and the mere knowledge that wildlife exists is a positive benefit to many people. There may be some concern that the proposed action or alternatives would result in the loss of aesthetic benefits to the public, resource owners or neighboring residents. An example of concerns pertaining to aesthetic impacts are concerns that the noise (e.g., from aircraft) or viewing evidence of PDM activities would adversely impact aesthetic enjoyment of activities such as hiking on public lands.

Native American cultural practices: Native American tribes such as the Nez Perce and Shoshone-Bannock tribes use natural resources for food, income and cultural practices. This Section also addresses potential for each of the alternatives to impact tribal uses of and relationships with wildlife resources and natural ecosystems.

2.2.6 Impacts on Public and Pet Safety and the Environment

Some members of the public may be concerned that WS-Idaho's management methods could threaten public and pet safety. For example, individuals may be concerned that pets could be inadvertently captured and injured or killed by devices used by WS-Idaho for PDM. Conversely, some PDM actions are conducted specifically to reduce risks to human health and safety from aggressive, ill or habituated animals. Factors considered in this Section include the potential impacts of PDM methods on public and pet safety and the ability of PDM actions to reduce risks to public and pet safety caused by the predator species addressed in this EA (Section 1.1). Analysis of this issue also addresses potential impacts to soils and water from PDM activities.

2.2.7 Cost Effectiveness

The CEQ does not require a formal, monetized cost benefit analysis to comply with the NEPA. Consideration of this issue is not essential to making a reasoned choice among the alternatives. Cost effectiveness is only one of the many considerations that go into PDM decision-making (See WS Decision Model Section 3.1.2). In some cases, over-riding concerns, such as the need to protect human health and safety or federally listed species, may warrant selection of a method or strategy that is not the most cost effective. Nonetheless, within alternatives, 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 (Slate et al. 1992, WS Directive 2.201), 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 cooperator funding and/or objectives and needs. Therefore, the cost of methods can often influence which methods are available to resolve damage and can influence the effectiveness of methods. This Section discusses available information relative to the cost effectiveness of PDM programs and efficacy of PDM methods.

2.2.8 Indirect and Cumulative Impacts

Indirect impacts are defined as those impacts which indirectly have an effect on the environment as a result of program implementation. Cumulative impacts, as defined by the CEQ, are impacts on the environment that result from the incremental impact of the action when added to past, present and reasonably foreseeable future actions, regardless of who undertakes such other actions (40 CFR 1508.7). This Section identifies and discusses the possible indirect and cumulative impacts of WS-Idaho's control actions under each alternative considered.

2.3 ISSUES NOT CONSIDERED IN DETAIL

This Section includes responses to issues and questions raised by the public during the public scoping period for this EA, comments on similar EAs and comments submitted on the 2014 supplement to the Southern Idaho Predator EA (USDA 2002*a*). Reasons for not addressing these topics in detail in Chapter 4 vary, but may include that the subject was a question about WS-Idaho PDM or PDM logistics and not an environmental issue which could be addressed in detail, the response to the issue was not expected to vary among alternatives or because the review presented below determined that none of the proposed alternatives would substantively impact the issue in question.

2.3.1 Livestock Losses Should Be an Accepted Cost of Doing Business

Some commenters stated that livestock losses should be an accepted cost of doing business and that no lethal PDM should be conducted to protect livestock. Advocates of this philosophy commonly express the sentiment that individuals should not have the right to take a public resource (wildlife) to protect private assets (livestock, domestic animals and other property). As noted in Chapter 1, although industry-wide losses to predators are relatively low in comparison to other factors, losses are not evenly distributed and losses to individual producers can be quite high. For example, within the past 5 years, four single-incident events (i.e., each incident was caused by a single predator during a single depredation event) involving large black bears or mountain lions resulted in 157, 140 and 120 sheep killed per incident and 57 beehives destroyed in a single incident (WS-Idaho Depredation Investigation Reports). State and federal agencies, through the promulgation of regulations and permitting processes, have determined that limited lethal take of wildlife is acceptable to allow individuals the opportunity to protect their private assets from damage caused by the public's wildlife. As noted in Section 3.2.1, landowners/managers have access to lethal PDM under these regulatory processes without the direct involvement of WS-Idaho. WS-Idaho has developed and analyzed alternatives in which it is not involved in PDM and in which it only uses nonlethal PDM methods, but the right of individuals to access lethal PDM methods on their own in response to livestock predation is outside the scope of WS authority.

2.3.2 A Loss Threshold Should be Established Before Allowing Lethal Methods

One issue identified through WS-Idaho's scoping process is a concern that WS-Idaho, USFS, BLM, IDL or other entities should establish a threshold of loss before employing lethal methods to resolve damage and that at least some 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 addition, establishing a threshold would be difficult or inappropriate to apply to human health and safety situations. For example, aircraft striking predators can lead to property damage and can threaten passenger safety if a catastrophic failure of the aircraft occurs because of the strike. Therefore, addressing the threats of aircraft strikes prior to an actual strike occurring would be appropriate.

2.3.3 No Wildlife Damage Management at Taxpayer Expense, PDM Should Be Fee Based

WS was established by the Secretary of Agriculture in response to Congressional authorization to provide wildlife damage management assistance to the people of the United States. Funding for WS-Idaho PDM comes from federal appropriations and other sources (http://www.aphis.usda.gov/wildlife_damage/prog_data/2013/A/Tables/PDR_Table_A.pdf). Such non-federal sources include ISDA, IDFG, local government funds (county or city), livestock associations, grazing fees, livestock producer wool tax funds, livestock brand inspection fees and private companies and businesses. These are all applied toward WS-Idaho operations. Federal, State and local officials have decided that addressing adverse impacts caused by the public's wildlife is an appropriate use of public resources and have allocated funds for these activities. A commonly voiced argument for publicly funded wildlife damage management is that the public should bear the responsibility for damage to private property caused by "publicly-owned" wildlife.

2.3.4 Global Climate Change/Greenhouse Gas Emissions

The State of the Climate in 2012 report indicates that since 1976, every year has been warmer than the long-term average (Blunden and Arndt 2013). Global surface temperatures in 2012 were among the top ten warmest years on record with the largest average temperature differences in the United States, Canada, southern Europe, western Russia and the Russian Far East (Osborne and Lindsey, 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. The distribution and abundance of a plant or animal species is often dictated by temperature and precipitation. According to the EPA (2013), as temperatures continue to increase, the habitat ranges of many species are moving 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).

WS recognizes that climate change is an ongoing concern and may result in changes in species range and abundance. Climate change is also anticipated to impact agricultural practices. The combination of these two factors over time is likely to lead to changes in the scope and nature of wildlife-human conflicts in the state. Because these types of changes are an ongoing process, the EA has developed a dynamic system including mitigations and SOPs that allow the agencies to monitor for and adjust to impacts of ongoing changes in the affected environment (Section 3.4). WS-Idaho would monitor activities conducted under this analysis in context of the issues analyzed in detail to determine if the need for action and associated impacts remain within the parameters established and analyzed EA. Established SOPs also include reporting all take to the USFWS and IDFG annually as appropriate for review of project-specific and cumulative impacts on wildlife populations. Coordination with agencies that have management authority for the long-term wellbeing of native wildlife populations and review of available data on wildlife population size and population trends enables the WS-Idaho to check for adverse cumulative impacts on wildlife populations, including actions by WS-Idaho that could jeopardize the long-term viability of WS-Idaho actions on wildlife populations. Monitoring would include review of federally-listed T/E species and consultation with the USFWS, as appropriate, to avoid adverse impacts on T/E species. As with any changes in need for action, WS-Idaho would supplement the analysis and/or modify PDM actions in accordance with applicable local, State and federal regulations including the NEPA, as needed, to address substantive changes in wildlife populations and associated impacts of PDM. In this way, we believe the proposed action accounts for and is responsive to ongoing changes in the cumulative impacts of actions conducted in Idaho in accordance with the NEPA.

The CEQ has advised federal agencies to consider whether analysis of the direct and indirect greenhouse gas (GHG) emissions from their proposed actions may provide meaningful information to decision makers and the public (CEQ 2014). Based on their review of the available science, CEQ advised agencies that if a proposed action would be reasonably anticipated to cause direct emissions of 25,000 metric tons or more of CO_2-equivalent GHG emissions on an annual basis the agencies should consider that a quantitative and qualitative assessment may be meaningful to decision makers and the public (CEQ 2014). WS has assessed the potential GHG impacts from its activities nationwide and current and proposed actions in context of this guidance.

The average person in a home produces four metric tons of carbon dioxide equivalents (CDEs includes CO_2, NOx, CO and SOx) annually (EPA 2010). Nationwide, WS has 170 district and State Offices and this includes district offices with only one staff person. Each State Office would likely produce fewer CDEs annually than the average home because little electricity is used at night and on weekends.

WS vehicles are used for a multitude of wildlife management projects, including current Idaho PDM activities. WS cannot predict the fuel efficiency of each all-terrain vehicle (ATV) used in the field nor can it predict how often an ATV would be used. However, if a conservative estimate of 20 miles per gallon is used and consideration is given to total mileage being substantially less than the mileage calculated for normal vehicular use, the effects of ATVs on air quality would be negligible. WS also cannot predict the fuel efficiency of each vehicle operated by WS. However, WS used the Federal Highway Administration (FHWA) estimated average combined fuel economy of cars and light trucks of 21.5 miles per gallon (mpg) in the discussion of alternatives. To establish baseline data on national WS activities, WS calculated the CDEs from its current fleet of passenger vehicles (1,665 leased and owned vehicles) using the average vehicle miles traveled per year as calculated by FHWA (2010)[10]. WS used the ratio of CO_2 equivalents (CDEs) to total greenhouse gas emissions for passenger vehicles to complete the calculation.[11] Current WS vehicle use for all wildlife management can contribute approximately 8,058 metric tons (MT) of CDEs each year.[12]

Nationwide, WS either owns or leases ten different types of helicopters; their average fuel consumption is 24.88 gallons per hour (gph). Helicopters with this average fuel consumption emit approximately 0.24 MT/hr of CO_2 emissions.[13] WS also owns or leases six different types of aircraft. Nationwide, WS flew 10,426 hours (helicopter and fixed wing combined) of agency-owned aircraft in FY 2013 and flew an additional 4,225 hours under contract aircraft. If all flight hours were attributed to fixed-wing planes, the estimated CO_2 emissions would be 1,612 MT/year. If all flight hours were attributed to helicopters, the estimated CO_2 emissions would be 3,516 MT/year. Combining vehicle, aircraft, office and ATV use for FY 2013 and

[10] 11,493 miles per vehicle per year
[11] 0.985
[12] (8.92 × 10-3 metric tons/gallon of gasoline) x (19,135,845 miles traveled by APHIS-WS) x (1/21.5 mpg) x (1/0.985)
[13] Conklin and deDecker Aviation Information (https://www.conklindd.com/CDALibrary/CO2Calc.aspx) for fixed-wing aircraft. Average fuel consumption rates for fixed wing piston engine aircraft is 12.9 gph (FAA 2005). Average CO_2 emissions for piston engine aircraft are 0.11 MT/hr (Conklin and de Decker 2015). Less than one percent each of NOx, CO, SOx, and other trace components are emitted from aircraft engine emissions (FAA 2005).

potential new vehicle purchases, the range of CDEs is likely to be 10,350 – 12,254 MT or less per year, which is below the CEQ's suggested reference point of 25,000 MT/year.[14]

One commenter suggested that WS should consider greenhouse gas emissions associated with livestock production as part of the emissions associated with WS. We do not concur that these emissions should be attributed entirely or in part to WS activities. The existence of WS is not essential to the survival of the livestock production industry and factors other than WS have been identified as the primary drivers for trends in the livestock industry. In a comparison of parts of the country with differing levels of coyotes and coyote predation on livestock Berger (2006) concluded that government support of the predation management had not prevented declines in the sheep industry and that production costs and market prices explained most of their model variations in sheep numbers. These findings are not surprising given that conflicts with predators are not spread out evenly among producers and that many producers have little or no issues with wildlife predation on their livestock. Additionally, as noted in Section 2.1, livestock producers can and do take measures on their own to address predation on livestock without involvement of WS. Consequently, although WS actions are beneficial to individual producers, the size and extent of the livestock production industry as a whole is not dependent upon WS.

WS understands that climate change is an important ongoing concern and has the potential to adversely impact humans, wildlife and native ecosystems (Melillo et al. 2014). WS would continue to participate in ongoing federal efforts to reduce greenhouse gas emissions associated with WS activities including compliance with Executive Order 1369 – planning for federal sustainability in the next decade. Given the information above, none of the alternatives proposed is anticipated to result in substantial changes that would impact national WS greenhouse gas emissions. Consequently, WS-Idaho operational activities likely to result from the proposed action would have a negligible effect on atmospheric conditions including the global climate.

2.3.5 Appropriateness of preparing an EA (instead of an EIS) for such a large area, rather than preparing multiple EAs for smaller, more site-specific areas

The appropriateness of preparing an EA instead of an EIS because of the size of the project area was a concern identified during the scoping process. Lead agencies have the discretion to determine the geographic scope of their analyses under the NEPA (CEQ 1508.25). Reasons for the scope of the analysis are as presented in Section 1.6. This EA emphasizes substantive issues as they relate to specific areas whenever possible. However, the issues that pertain to predator damage and resulting management are the same, for the most part, wherever they occur, and are treated as such. We have determined that a more detailed and more site-specific level of analysis would not substantially improve the decision-making process and pursuing a

[14] CEQ issued a memorandum to heads of federal agencies and departments on February 28, 2011, providing draft guidance on when and how to analyze the environmental impacts of greenhouse gas emissions and climate change under NEPA. A suggested 25,000 metric tons of carbon dioxide equivalent emissions from the proposed action would trigger the need for a quantitative analysis.

more site-specific and more detailed analysis might even be considered inconsistent with NEPA's emphasis on reducing unnecessary paperwork (Eccleston 1995). In terms of considering cumulative effects, one EA analyzing impacts for the entire State of Idaho would provide a more comprehensive and less redundant analysis than multiple EAs covering smaller areas. WS-Idaho's determination to prepare an EA is consistent with APHIS NEPA implementing regulations (7 CFR Part 372) specifying the types of actions normally requiring EAs, but not necessarily EIS'. See also Chapter 5 responses to Issues 68, 110, and 111.

One of the decisions to be based on this analysis is the determination of whether the proposed action or the other alternatives could potentially have significant direct, indirect or cumulative impacts on the quality of the human environment that would warrant the preparation of an EIS. If WS-Idaho makes a determination through this EA that the proposed action or the other alternatives could have a significant impact on the quality of the human environment, then WS-Idaho would publish a notice of intent to prepare an EIS and this EA would be the foundation for developing the EIS.

2.3.6 Concerns that the effects of the Proposed Action may be "highly controversial" or "highly uncertain," which could require that an EIS be prepared

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, 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-Idaho made a determination through this EA that the effects were highly uncertain, then WS-Idaho would publish a notice of intent to prepare an EIS and this EA would be the foundation for developing the EIS.

2.3.7 Does the killing of wildlife constitute irreparable harm?

Some members of the public have suggested that the killing of any wildlife represents irreparable harm because of the loss of individual animals. Under the current and proposed alternatives, an individual predator or multiple predators in a specific area may be killed through WS-Idaho PDM activities. Although we recognize that some individuals would find this loss distressing, analysis in Chapter 4 indicates the current and proposed actions would not in any way irreparably harm the continued existence of these species. Idaho's historic and current populations of big game animals, game birds, furbearers and unprotected predators, which annually sustain harvests of thousands of animals, are obvious testimony to the fact that the killing of wildlife, as is currently managed under modern requirements to maintain sustainable populations of native species, does not cause irreparable harm. All WS-Idaho PDM activities would be conducted under the authorization of and in coordination with the IDFG and USFWS, as appropriate. These entities are charged with preserving healthy and sustainable wildlife populations for current and future generations. The IDFG and USFWS would never intentionally allow any activity that would cause irreparable harm to the wildlife resources under their protection.

2.3.8 Could WS-Idaho employees unknowingly trespass onto private lands or across State boundary lines, either on the ground or during aerial hunting activities?

WS-Idaho is well aware that it is sometimes difficult to determine land ownership in some areas and WS-Idaho field employees make diligent efforts to ensure that they do not enter properties where they do not have permission. Landowners who request assistance from WS-Idaho typically provide information not only about the property boundaries of their own land, but about the boundaries of neighboring lands as well. WS-Idaho aerial hunting activities are typically conducted with the aerial crew in radio contact with WS-Idaho personnel on the ground who knows the property boundaries of the area being worked.

2.3.9 Criteria for determining which predator species would be targeted for removal efforts to benefit sage-grouse nest success and chick survival

PDM for the protection of game species or sensitive species such as sage-grouse would only be conducted if WS-Idaho receives a request from the IDFG. Should WS-Idaho become involved with PDM activities aimed at benefiting sage-grouse nest success and chick survival, the IDFG would identify which predators are to be targeted. Many species of predators that prey on sage-grouse chicks and adults also prey on sage-grouse eggs. Conover and Roberts (2016) found that in studies that documented the species responsible for depredations at various life stages of the sage-grouse, found that of those individuals (adult, juvenile, egg) that were depredated, land predators (e.g., coyotes, foxes, badgers, etc.) were responsible for nearly 30% of the take of adult birds, over 63% of the juvenile birds and nearly 61% of the eggs consumed. A logical criteria for targeting potential sage-grouse predators would, therefore, be to target those predators that prey on both eggs *and* chicks. To the extent that some of those predators preying on chicks also prey to some degree on sage-grouse nests, removal of those predators could provide additional benefit to sage-grouse recruitment by increasing nest success as well as chick survival. Those species that have been documented to depredate upon sage-grouse eggs and chicks and which occur in Idaho include; raptors, ravens, coyotes, red fox, badgers and bobcats.

Various species of ground squirrels occupy sage-grouse habitat, but there is very little documentation of depredation of sage-grouse eggs. Recent research (Coates 2007, Holloran and Anderson 2003) suggests that several ground squirrel species (Piute, Wyoming, Thirteen-lined, and Richardson's) are incapable of biting into eggs. Hagen (2011), citing Pietz and Granfors (2000), suggests ground squirrels may depredate altricial hatchlings but the extent of such on precocial young is unknown.

2.3.10 Potential for removal of coyotes and badgers, which are predators of ground squirrels, to actually exacerbate predation on sage-grouse nests if ground squirrels are one of the primary sage-grouse nest predators in Idaho

The extent to which ground squirrels are predators on sage-grouse eggs appears to depend on the size of the ground squirrel. Patterson (1952) reported that ground squirrels were one of the primary predators on sage-grouse nests in his study areas in Wyoming. Patterson presented little direct evidence, but suggested that Richardson's (*S. richardsonii*) and thirteen-lined ground squirrels (*S. tridecemlineatus*) were the primary nest predators. However, Sargeant et al. (1987), in trying to determine whether or not these same two species of ground squirrels were predators on duck nests, found no evidence whatsoever that Richardson's or thirteen-lined ground squirrels would prey on duck eggs. When they exposed mallard (*Anas platyrhynchos*) and blue-winged teal (*A. discors*) eggs to wild, free-ranging Franklin's (*S. franklinii*), Richardson's and thirteen- lined ground squirrels, they found that the larger Franklin's ground squirrels preyed on these eggs almost 97% of the time, but the smaller Richardson's and thirteen-lined ground squirrel species never once preyed on these eggs. Using motion-activated cameras concealed at sage-grouse nests in his Wyoming study area, Holloran (1999) documented visits to sage-grouse nests by Richardson's and thirteen-lined ground squirrels, but they were never implicated as nest predators. Similarly, video monitoring of sage-grouse nests in northwestern Nevada by Coates et al. (2008) and Lockyer et al. (2013) also indicated that Wyoming ground squirrels and Piute ground squirrels did not prey on sage-grouse eggs and in only once instance was a California ground squirrels able to prey on sage-grouse eggs (predation occurred when the ground squirrel pushed the egg from the nest and cracked it).

Ground squirrel species in Idaho include the Northern and Southern Idaho ground squirrel (*Spermophilus brunneus and S. b. endemicus,* respectively), Townsend's ground squirrel (*S. townsendii*), Uinta ground squirrel (*S. armatus*), Belding's ground squirrel (*S, beldingi*), Columbian ground squirrel (*S. columbianus*), rock squirrel (*S. variegatus*), golden-mantled ground squirrel (*S. lateralis*) and Wyoming ground squirrel (*S. elegans*) (Digital Atlas of Idaho Project 2015). Of these species, only rock squirrels and Columbian ground squirrels are similar or greater in size than Franklin's ground squirrel and likely to be able to prey on sage-grouse eggs (NatureServe Explorer 2015). Rock squirrels do not generally use habitat where sage-grouse occur. Columbian ground squirrels do use habitats where sage-grouse occur, however, for reasons presented in Section 4.2.1.2, we do not anticipate that coyote or badger removals would result in substantive increases in Columbian ground squirrel populations.

2.3.11 Concerns that predator control activities may interfere with other, ongoing scientific research projects

All WS-Idaho PDM activities, whether on public or private lands, are conducted only on a request basis and are coordinated with the land management agency or land owner/manager. The land management agency or landowner is typically aware of any ongoing or proposed research and all activities are coordinated to reduce or eliminate interference. Additionally, WS-Idaho involvement in any predator control projects requested by IDFG would be coordinated with department personnel to ensure that there were no potential conflicts with any ongoing or proposed research projects. WS-Idaho has also established a system of regular consultation with the Nez Perce Tribe that will provide opportunity to coordinate actions so that tribal research projects are not adversely affected. Similar systems of consultation may be set up with other federally-recognized tribes in Idaho at the tribe's request.

2.3.12 Appropriateness of manipulating wildlife for the benefit of hunters or recreation

Some individuals, including some Native American tribes feel it is not appropriate to manipulate one wildlife species for the benefit of another wildlife species, or for the benefit of hunters or recreation. Opinions on this issue vary among individuals depending on personal values and experiences relative to wildlife. The jurisdiction for managing most resident wildlife rests with the IDFG and all determinations regarding the need for and appropriateness of PDM to benefit hunters or recreation are made by IDFG. IDFG may request WS-Idaho's assistance in achieving their management objectives which may include efforts to increase populations of game species to create hunting opportunities. In these cases, IDFG provides all funding for these projects and also establishes program objectives and specifies procedures (e.g., IDFG 2013*a*). These determinations are outside of the authority of WS-Idaho, and therefore, are not addressed in detail. Perspectives on ethics and humaneness issues are further discussed in detail for each of the alternatives in Chapter 4 Sections 4.2.1.4, 4.2.2.4, 4.2.3.4 and 4.2.5.4).

2.3.13 Tribal concerns that projects to protect one wildlife species by using lethal methods to remove other species inappropriately places higher value on some species

Wildlife species have specific cultural significance to Native American tribes, groups within tribes and specific individuals. The Shoshone-Bannock Tribes and Nez Perce Tribe expressed concerns regarding the perceived species favoritism inherent in conducting PDM for protection or enhancement of wildlife populations. The decision to manage predators (e.g., ravens) for the protection of a specific prey species (e.g., sage-grouse) is not a matter of considering one species more important than another. Instead, the decision reflects the difficult choices made by the IDFG and USFWS when attempting to sustain viable populations and meet management objectives for wildlife species. For example, sage-grouse populations in the west have declined to the point where the species has been considered for protection under the ESA and millions of dollars are being allocated to sage-grouse recovery and habitat restoration. In contrast, as presented in Chapter 4 of this EA, common raven populations are increasing and at artificially high levels in many portions of the State because of human-generated food and habitat. This issue was not addressed in detail because determinations regarding the need for PDM to protect wildlife are outside the scope of WS authority. However, it is important to note that PDM actions for this purpose are generally only requested as a supplement to other management actions, and that there are other related and ongoing activities to enhance game species survival and success.

2.3.14 Effectiveness of PDM 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 and the species responsible for the damage, 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-Idaho's personnel, the guidance provided by WS' directives and policies. In addition to reducing or preventing loss, an effective program must enable timely implementation of management actions and minimize harm to humans, non-target animals and the environment, while at the same time, using methods as humanely as possible.[15] Given the wide range of damage situations and cooperator management objectives, the most effective approach to resolving any wildlife damage problem uses an adaptive integrated strategy involving access to the widest possible range of management methods. Under the integrated approach, methods are selected from the list of available techniques to address site-specific circumstances and management objectives and implemented either simultaneously or sequentially to resolve the damage problem (Courchamp et al. 2003).

The goal for all of the WS-Idaho action alternatives would be to reduce damage, risks and conflicts with wildlife as requested and not to reduce/eliminate populations. Localized population reduction would generally be short-term with new individuals immigrating into the area or born to animals remaining at the site (Courchamp et al. 2003). The ability of an animal population to sustain a certain level of removal and to eventually return to pre-management levels does not mean individual management actions were unsuccessful, but that periodic management may be necessary. The return of wildlife to pre-management levels also demonstrates that limited, localized damage management methods have minimal impacts on species' populations.

WS-Idaho 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 WS-Idaho used lethal methods. However, the use of nonlethal methods would also often be temporary, which could result in predators returning to an area where damage was occurring once WS-Idaho 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.

Impacts of any method that disperses or removes predators from areas are expected to only be temporary if habitat containing preferred habitat characteristics continued to exist. Dispersing predators using nonlethal 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. Dispersing and translocating predators, particularly animals that have learned to take advantage of resources associated with humans, may just move a problem from one area to another. This could require addressing damage caused by those predators at their new location, which increases costs and could be perceived as creating a financial incentive to

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

continue the use of dispersal and relocation because predators would have to be addressed annually and at multiple locations. WS-Idaho's recommendation of or use of techniques to modify existing habitat or making areas unattractive to predators is discussed in Appendix B. The objective of WS-Idaho 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. Localized population reduction would also likely be a short-term solution, particularly for highly mobile species like common ravens. Large scale population reduction by limiting survival or reproduction, removing animals and habitat modification would be considered a long-term solution to managing damage caused by wildlife, as would construction of fences and some types of habitat modification and cultural practices. Large-scale population reduction is rarely considered an acceptable or viable solution to conflicts with predators and WS-Idaho uses a more targeted approach that focuses on individual animals or local populations associated with specific conflicts.

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. Nonlethal 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. Nonlethal 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 or its habitat and identifying the habitat characteristics that attract predators to a particular location. Habitat management practices which may result in long-term resolution of damage problems are generally conducted by the landowner/manager who is responsible for ensuring that habitat management actions are conducted in accordance with applicable federal, State and local regulations for the protection of the environment.

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, Shaw 1987, Howard and Booth 1981). Shwiff and Merrell (2004) reported a 5.4% increase in the numbers of calves brought to market when coyotes were removed by aerial operations. 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.

A recent study by Treves et al. (2016) criticizes certain research on lethal predator damage management methods and recommends suspension of these tools until more rigorous scientific studies prove their efficacy. The authors in this paper call for new study designs that use the same standards as those in controlled laboratory settings for biomedical research. NWRC research scientists have evaluated this paper and do not agree with the authors' assessment that existing research is flawed. 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 cannot be controlled. Assumptions must be made when trying to answer complex ecological questions in field settings. Scientists address and acknowledge these variabilities using well-established and recognized field study designs, such as the switch-back and paired block designs. Additionally, Treves et al.'s (2016) critique of at least two studies by scientists currently working for WS did not accurately interpret or represent the studies' designs or results and raises questions regarding additional misrepresentations and errors in the paper. Details on WS' review of Treves et al. (2016) are provided in Appendix G.

WS agrees that predation damage management tools and techniques must be based on rigorous, scientifically-sound principles. Researchers at NWRC are dedicated to gathering information, testing new ideas and methods and using experiments (versus observational studies) as much as possible. WS' scientists at NWRC's Utah Field Station are leaders in the design and implementation of controlled studies to evaluate predation and predator control methods. They collaborate with experts from around the world to conduct these studies and findings are published in peer-reviewed literature.

In conclusion, we believe that this EA uses the best available information regarding the efficacy of PDM methods. No one method or group of method (nonlethal or lethal) will be effective under all conditions. Consequently, this EA analyzes alternatives that provide access to groups of methods which may be employed using an adaptive integrated PDM process. Because of site-specific variations in efficacy of methods, this process includes continuous evaluation of activities at each project site and adjustment of methods as needed to achieve management objectives while also minimizing environmental impacts. 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 1 for each damage management request based on the continual evaluation of methods and results and does not need to be addressed as a separate issue in detail.

2.3.15 Appropriateness of using rancher-supplied data to quantify livestock losses

Some of the public feel that ranchers often intentionally overestimated the extent of their livestock losses in order to justify more control work. Pearson (1986), however, reported on several studies that indicated little or no bias occurred in ranchers reporting loss and Shelton and Klindt (1974) found that some ranchers underestimated their losses due to some husbandry practices. Schaefer et al. (1981) investigated sheep predation and determined that: 1) producers correctly assessed the cause of livestock death more than 94% of the time; and 2) the results of two types of loss surveys yielded similar results. Average losses attributed to predation by Idaho sheep producers in 2011 and 2012 amounted to about 25% of the total reported death loss (Table 1.1). However, through intensive monitoring conducted during a study on three typical range sheep operations in southern Idaho, Nass (1977) found that predation was actually responsible for 56% of the total death losses. This data suggests that attributing an average of 25% of total death losses to predation is not unrealistic and may even suggest that Idaho sheep producers could be underestimating their predation losses. Regardless, the need for action in this EA is not solely based on rancher-supplied data. Chapter 1 Section 1.2 provides a range of information on the need for action including losses verified by WS-Idaho employees, losses reported to WS-Idaho and information from scientific literature (Tables 1.3 and 1.4). WS does not initiate PDM actions at any site without verifying the species involved and the need for action. Most reports that show livestock loss are generally derived from NASS surveys of livestock producers. Within their Statement of Commitment to Scientific Integrity, they state: "*Federal statistical agencies (or units) whose principal function is the collection, analysis, and dissemination of information for statistical purposes have set for themselves a high standard of scientific integrity…. These agencies embrace a common set of professional standards and operational practices designed to ensure the quality, integrity and credibility of their statistical activities. Implementation of these professional standards involves a wide range of managerial and technical challenges.*

To address these challenges, the National Research Council of the National Academies (NRC) has developed practical guidance in its publication, Principles and Practices for a Federal Statistical Agency. The principal statistical agencies use this volume to guide their strategic planning, daily operations, and interactions with stakeholders" (NASS 2016*b*).

2.3.16 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 proposed action and the alternatives. Therefore, the level of site-specificity must be appropriate to the issues listed.

The analysis in this EA was driven by the issues raised during the scoping process. In addition to the analysis contained in this EA, WS-Idaho personnel would use the WS Decision Model

(Slate et al. 1992, WS Directive 2.201) described in Chapter 3 as a site-specific tool to develop the most appropriate strategy for alleviating damage or threats of damage at each location. The WS Decision Model is an analytical thought process used by WS-Idaho personnel for evaluating and responding to requests for assistance. Additional site-specific issues and review occurs during preparation of AWPs for State and federal public lands.

As discussed previously, one EA analyzing the impacts for the entire State would provide a more comprehensive and less redundant analysis that allows for a better cumulative impact analysis than multiple site-specific EAs. 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.

2.3.17 WS-Idaho conducting PDM on private property verses public lands

There is some concern from the public about how PDM activities would be conducted on private property verses public lands. WS-Idaho PDM activities on private property are carried out only after the landowner or manager has requested services from WS-Idaho and after an *Agreement for Control* has been signed by both parties. This agreement stipulates which methods may be used on the property. PDM activities on public lands are only carried out after development of site specific work plans between WS-Idaho and the respective land management agencies. These plans stipulate any restrictions that may be deemed necessary to ensure public safety or resource protection on those public lands. WS-Idaho's PDM activities on public lands are typically carried out under more restrictions than on private property in order to mitigate the likelihood of conflicts with users of public lands. Regardless, control actions on private property is not conducted indiscriminately or without bounds. The same use of the WS Decision Model is employed for private land application as much as for public land applications. The use of restricted-use pesticides, if used, still complies with the product label restrictions, whether applied on public lands or on private lands (Note: As stated in this EA, the M-44 device will not be used on public lands.). Use of all other control tools and techniques are used judiciously to minimize adverse impacts regardless of their use on public or private property.

2.3.18 Rancher responsibility to protect their own livestock through use of husbandry methods

Although there is no law or policy requiring livestock producers to employ good husbandry practices to protect their livestock, most Idaho sheep producers do employ a variety of husbandry practices to protect their sheep as a matter of good business. Nearly all of Idaho's range sheep operations use livestock guarding animals to protect their sheep and all of them employ herders to stay with the sheep. In addition, more and more livestock grazing permittees who graze cattle on USFS grazing allotments are employing range-riders to watch over the livestock.

Most requests for assistance to protect sheep from predation come from producers who are already employing nonlethal control measures, but experience predation problems in spite of these practices. It is WS-Idaho policy to respond to all requests for assistance within WS authority and responsibility and available resources. If improved husbandry practices would likely reduce a predation problem, WS-Idaho makes recommendations regarding these practices.

2.3.19 Concerns about dead ravens being observed in and around stock tanks in areas of Nevada where DRC-1339 has been used

WS-Idaho is aware that ravens may seek out water resources prior to dying after ingesting a lethal dose of DRC-1339; however, very few would die at a watering source, rather, they generally return to their roosting area, loafing sites, or other areas where they could rest with minimal predation risk when they experience listlessness caused by the chemical's effect on the renal system (Spencer 2002). Because the affected bird's kidneys cease functioning, they become unconscious and die (Spencer 2002). As discussed in the Chapter 4 analysis of impacts on non-target species, DRC-1339 is rapidly metabolized, so that there is negligible risk of undigested DRC-1339 in ravens that are killed using this method. Given the low likelihood that birds would die at or near stock tanks and the extremely low probability of secondary poisoning hazards from DRC-1339 use because the product is normally metabolized by the body before symptoms occur, contamination of water with carcasses of birds killed with DRC-1339 is not anticipated and will not be analyzed in detail.

2.3.20 Does the scientific literature (Cote and Sutherland 1997; reviewed by Hagen 2011) discredit the premise that predators adversely affect bird populations including sage-grouse nesting success and recruitment?

Hagen (2011) reports that generally, sage-grouse nest-success rates and adult survival are high, suggesting that on average predation is not limiting. However, in fragmented landscapes or in areas with subsidized predator populations, Hagen (2011) reports that predation may limit population growth. In essence, Hagen (2011) is suggesting that his review of the literature supports raven control under certain circumstances. Hagen (2011) further reports that predator management studies have not provided sufficient evidence to support implementation over board geographic or temporal scales, but limited information suggests predator management may provide short-term relief for a population sink. Evaluating the need for predator management requires linking reduced demographic rates to habitat quality (fragmentation or degradation) or predator populations out of the natural range of variability (exotic species or subsidized populations). Again, Hagen (2011) suggests that predator control could be a viable option for wildlife managers under select environmental circumstances. Lethal predator management has been used with some short-term successes with T/E species (Hagen 2011). With the greater sage-grouse previously considered by the USFWS for listing under the ESA and subject to intensive governmental, tribal and private recovery efforts, there is still interest in the potential for raven control to provide short-term benefits to sage-grouse nest success and survival of young in select situations. Historically, most predator control projects were designed to protect domestic livestock, not wildlife. The question remains as to whether or not predator management can be an effective conservation tools, and if so, under what conditions it may be appropriate to use it (Hagen 2011).

2.3.21 Dinkins (2013) did not detect a significant increase in sage-grouse nesting success when WS reduced the raven population in Wyoming, so why does IDFG believe raven removal for sage-grouse protection is needed?

The results of a research project in Wyoming reported by Dinkins (2013) has limited biological relevance because the raven removal for which the author made his conclusions was implemented for the protection of livestock and not specifically for the protection of sage-grouse eggs or young. The objectives and application of DRC-1339 treated egg baits for the purpose of raven predation management on livestock are totally different than those in removing ravens in order to evaluate nest success of sage-grouse. The most striking difference is the location of where the ravens are removed. For livestock protection, ravens are targeted at or very near the location where livestock depredations occur, such as calving grounds or confined feeding operations. In these areas, cattle and calves are concentrated in a very small geographic area – areas not generally used by sage-grouse for nests or leks. In contrast, raven predation management to enhance nest success of sage-grouse is conducted in and around leks and is dispersed over larger geographic areas and far from livestock birthing operations. Sage-grouse leks and nesting locations and raven populations are not concentrated, which requires the application and placement of DRC-1339 treated egg to be distributed over a much larger area.

It is not accurate to conclude that Dinkins (2013) concluded that raven removal failed to result in improvements in sage-grouse nest success. Dinkins (2013) did report that sage-grouse nest success was negatively impacted by the presence of ravens within 550 m of a sage-grouse nest. Furthermore, success of sage-grouse nests in areas not occupied by ravens during the last nest check was estimated at 41% using a 28- day incubation period; whereas, the success of nests in areas occupied by ravens was estimated at only 22% (Dinkins 2013), suggesting that the nest success was almost double where ravens were absent compared to areas where ravens were present. Dinkins (2013) noted that the best model developed based on the criteria he considered did not account for a large proportion of spatiotemporal variability in sage-grouse nest success, and that factors such as weather may have also been important in determining sage-grouse nest success. A revised review of the same data with analysis of additional factors including temporal variation in climate and habitat quality was subsequently conducted and submitted for peer review (Dinkins et al. 2016). The revised review indicated that raven density decreased at study sites with WS raven removal and that sage-grouse nest success was higher in years with reduced raven densities. Authors noted that given the distance between the sage-grouse sites and WS raven removals, the majority of the reduction was associated with removal of birds that were not on breeding territories. The authors concluded that raven removal may have a place in sage-grouse management as an interim mitigation measure in areas with low sage-grouse nest success when sage-grouse populations are subjected to high densities of ravens, but that long-term solutions are necessary such as reducing supplemental food sources and perch structures used by ravens. Consistent with our comments in the preceding paragraph, Dinkins et al. (2016) also noted that targeted raven management to benefit sage-grouse may have better results than the indirect impacts associated with their study. This conclusion is consistent with the proposed use of PDM as a supplement to other natural resources protection efforts as presented in Section 1.2.3.

2.3.22 Qualifications of WS-Idaho personnel

Some members of the public are concerned about the qualifications of WS-Idaho personnel who carry out PDM activities. WS-Idaho employees are experienced in the use of a wide variety of damage management methods and are provided initial and recurring training on use of firearms, aerial shooting, application of pesticides and immobilization and euthanasia controlled substances. All employees using pesticide products are certified by the ISDA as professional applicators as well as various other forms of training that allow them to perform their duties professionally, such as T/E species identification, firearm use and safety, chemical immobilization drug use, and depredation investigation standards. Additionally, they have all passed standard federal background checks and additional Drug Enforcement Agency background checks to use chemical immobilization drugs.

2.3.23 Role of Carnivores in Seed Dispersal

The role of animals in dispersing seeds either through consumption and eventual defecation of viable seed or mechanical transport on fur or feathers is not new. However, animals such as felids, with a almost exclusively meat diet, are not commonly considered as playing a role in seed dispersal through consumption and defecation. However, a study by Sarasola et al. (2016) used scat analysis to document that mountain lions accidentally consumed seeds initially eaten by prey and that seeds of at least the 3 main plant species detected remained viable after passing through the cougar digestive tract. Although this study revealed a previously overlooked function for predators in ecosystems, analysis in Section 4.2.1.2 indicates that the proposed action has a very low impact on mountain lions in the state and is not contributing substantively to impacts on the mountain lion population when considered in context of hunter harvest. Consequentially potential for WS to impact seed dispersal is extremely low and will not be addressed further.

CHAPTER 3: ALTERNATIVES INCLUDING THE PROPOSED ACTION

3.0 INTRODUCTION

WS-Idaho's alternatives must encompass the varied and diverse needs of PDM and be applicable throughout the program. The varied nature and species diversity inherent in the various requests for assistance to manage damages caused by predators requires WS-Idaho to be diverse, dynamic, responsive and flexible. The program, under any selected alternative, must be adaptable to varied situations that can be accomplished in a timely manner. Table 1.4 compares the varied methods that should be used in each alternative.

3.1 ALTERNATIVES ANALYZED IN DETAIL

- **Alternative 1: Continue the Current Federal WS-Idaho PDM Program**. This is the current WS-Idaho operational program. It is also the "No Action" alternative as defined by the CEQ for ongoing programs.

- **Alternative 2: No Federal WS-Idaho PDM Program**. This alternative would terminate the federal WS-Idaho PDM program.

- **Alternative 3: Nonlethal Management Only WS-Idaho PDM Program**. Under this alternative, WS-Idaho would use only nonlethal PDM tools and methods in attempting to resolve predator damage and conflicts.

- **Alternative 4: Nonlethal Required before Lethal Control**. This alternative would not allow any lethal control by WS-Idaho until nonlethal methods have been tried and determined to be inadequate in each depredation situation.

- **Alternative 5: Modified Current Federal WS-Idaho PDM Program (Proposed Alternative)**. The Proposed Action would be a continuance of the current program and slightly modified to increase future program focus on natural resource protection including sage-grouse, bighorn sheep, pronghorn antelope and other wildlife species designated to be in need of special protection including T/E species.

3.2 DESCRIPTION OF THE ALTERNATIVES

3.2.1 Alternative 1: Continue the Current Federal WS-Idaho PDM Program

The current PDM program in Idaho is also termed the "No Action" alternative because it proposes no changes from the existing program, consistent with CEQ's definition for the No Action alternative in situations with ongoing programs. The "No Action" alternative is also a procedural NEPA requirement (40 CFR 1502.14(d)) and serves as a baseline for comparison with the other alternatives. This alternative continues the current Integrated PDM program in Idaho. WS-Idaho would use an adaptive strategy that encompasses the concurrent or sequential use of practical and effective lethal and non-lethal methods to prevent or reduce damages by predators, while minimizing any harmful effects of damage management measures on humans, target and non-target species, and the environment. The WS Decision Model described below would be used to identify effective and selective site specific management strategies. WS-Idaho's PDM activities are coordinated with applicable state, federal and local agencies and tribes with technical expertise and regulatory authority pertaining to PDM (Section 1.7.1, Appendix E). When appropriate, non-lethal methods, such as physical exclusion, habitat modification, or harassment, would be recommended or utilized to reduce damage. In other situations, wildlife could be removed as humanely as practicable using shooting, trapping, or registered pesticides and other methods. In determining the damage management strategy, preference would be given to practical and effective non-lethal methods (WS Directive 2.101). However, non-lethal methods may not always be applied as a first response to each damage problem, based on the nature of the problem and practices already implemented by the landowner/manager. The most appropriate response could often be a combination of non-lethal and lethal methods, or it could include instances where application of lethal methods alone would be the most appropriate strategy (e.g., risks to human health and safety).

Most of the requests for PDM assistance come from private resource owners, particularly livestock operators who may utilize both private and public lands. The majority of the livestock owners are based on private land and many of these individuals graze their livestock on public lands for a portion of the year. In FY 2015, WS-Idaho Management Information System (MIS) data indicate that during FY15, 65% of the livestock depredation management work tasks reported in the MIS system were on private lands and only 35% were on public lands. Many of the livestock owners also graze their livestock on lands which adjoin public lands and experience predation caused by animals which also use the adjacent public lands.

WS-Idaho also receives some requests for PDM assistance to protect other agricultural products (i.e. crops, poultry, livestock feed, range/pasture, etc.); property (i.e. pets [domestic dogs and cats], landscaping, etc.); natural resources; and human health and safety. Most of these requests come from private individuals. However, requests may also come from public entities, such as a county Sheriff's Department, city parks, IDFG or other local, State, federal, or tribal government office or resource manager. Occasionally, a federal land management agency could request WS-Idaho assistance. PDM provided by WS-Idaho personnel can be conducted on public, private, state, tribal and other lands or any combination of these land class types, as appropriate.

The current PDM program on **private lands** is governed by national WS policy, applicable State, federal and local regulations pertaining to the species involved and PDM methods, and a specific private property agreement for that particular property which specifies the methods to be used, the species to be targeted and any PDM activity restrictions the property owner requests.

The current PDM activity on **federal lands** (pubic and non-public) is defined specifically in AWPs, national policies of the applicable land management agency, cooperative service agreements WS' policies, and applicable state, federal and local regulations pertaining to the species involved and PDM methods. WS has national MOUs with the USFS (signed July 5, 2011) and BLM (signed August 29, 2012) giving WS the authority and responsibility to be the lead agency under NEPA with USFS and BLM as participating agencies and providing information and assistance, respectively, when requested. Concerning WS-Idaho's PDM activities on lands managed by the USFS and BLM, the MOU states that the USFS and BLM will cooperate with WS in development and timely review of AWPs. All anticipated WS-Idaho PDM activities on USFS and BLM lands are outlined in WS-Idaho AWPs. WS-Idaho develops an AWP for each specific USFS National Forest or Forests and BLM District Office annually.

Coordination meetings are held yearly between WS-Idaho and personnel from the land management agencies to discuss accomplishments of the previous year, issues of concern and any anticipated changes in proposed AWPs. Site specific information for proposed work is detailed in the AWPs and on associated maps, as appropriate, provided by USFS or BLM. Requests for control work on USFS and BLM lands can come from the livestock grazing permittees, the land managing agency or adjoining property owners. IDFG has management authority for resident wildlife species on BLM and USFS lands and the USFWS has management authority for migratory birds and T/E species. Any of the land management agencies, IDFG or USFWS could request WS-Idaho to conduct PDM for protection of wildlife species managed by those agencies.

The current PDM activity on **State lands** (public and non-public) is also defined specifically in AWPs, cooperative service agreements, state land agency's policies, WS' policies, and applicable state, federal and local regulations pertaining to the species involved and PDM methods. WS-Idaho has entered into an MOU with IDL (signed March 2, 2010) which states that WS-Idaho will provide the appropriate IDL Area Office with an AWP describing planned PDM activities that may be conducted on Idaho Endowment lands and to provide a summary report describing the results of the previous year's PDM actions. Request for PDM on IDL lands are normally received from livestock producers.

During AWP meetings, WS-Idaho provides information on proposed actions to the cooperating agencies (USFS, BLM and IDL). BLM, USFS National Forests and IDL are responsible for reviewing the proposed actions to assess their compatibility with established RMPs, LRMPs or other land/resource use plans. It is the land management agency's responsibility to clearly show where a proposed action would likely conflict with land use plans. In cases where the land management agency demonstrates that a conflict between WS-Idaho's proposed action and established land use plans exists, further discussions are initiated to establish what measures are necessary to alleviate the conflict. Maps are used to delineate areas where PDM restrictions or limitations are needed to avoid conflicts with land uses. These meetings, along with the WS Decision Model (Slate et al. 1992, WS Directive 2.201), provide further site specific planning mechanisms to evaluate and monitor the program. The AWPs must be consistent with the specific USFS National Forest, BLM District or IDL Area land and resource management plans and policies. All measures adopted from the RMP and LRMPs and associated NEPA analyses are considered part of the AWP.

Planned Control Areas. Planned control areas are sites/locations where WS-Idaho is actively working or plans to work to limit agricultural or natural resource losses, damages to property or threats to human health and safety. Planned activities are those which are anticipated to occur based on historical needs. Depredation control work is most concentrated in areas where livestock are most abundant and during times when they are most vulnerable to predators (e.g., during calving and lambing). Requests for assistance in reducing property damage and threats to human health and safety are by their nature, intermittent and thus less predictable.

Summary of Major Planned Seasonal Activities and PDM Methods Used for the WS-Idaho Districts. WS-Idaho is roughly divided into two supervisory Districts, the West and East Districts, which assist each other as necessary (see Figure 3-1.). The major planned activities and brief descriptions of the District programs are summarized below. The selection of methods to control depredation follows the WS Decision Model (Slate et al. 1992, WS Directive 2.201) on a case-by- case basis.

West District. The West District is comprised of Owyhee, Elmore, Camas, Boise, Ada, Adams, Canyon, Gem, Payette, Gooding, Washington and Valley counties; portions of Custer, Lincoln and Twin Falls counties, and all counties north of Valley County. During late fall and winter (November through March), requests for PDM assistance on lambing and calving grounds on private property and some BLM grazing allotments are scattered throughout the District, but primarily concentrated in the southern portion of the District. Aerial shooting with fixed-wing aircraft is generally one of the most effective control methods where terrain is relatively flat. Other control methods, such as foothold traps, snares, M-44s and ground shooting, are also used in these areas where large concentrations of sheep occur. WS-Idaho PDM activities primarily occur on BLM and private lands.

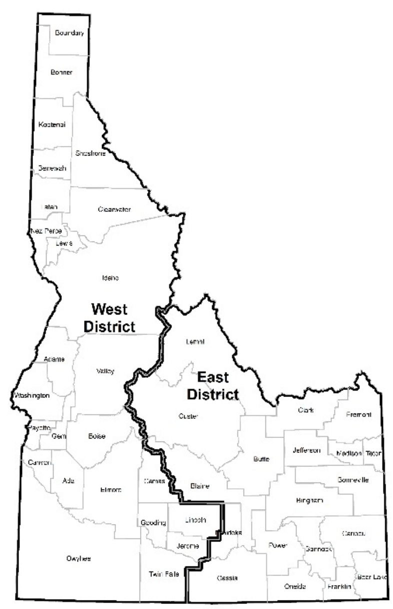

Figure 3-1. WS-Idaho West and East District Boundaries. Boundary locations are not exact.

During the spring (March through June), most PDM assistance is mostly concentrated on BLM and private lands in the southern-half of the District protecting the same livestock resources as in late fall and winter. All legal methods are used as needed and appropriate.

During summer and early fall (July through October), WS-Idaho's PDM assistance mostly occurs to control predation on sheep and cattle on USFS summer grazing allotments, some high elevation BLM grazing allotments and private property. Aerial shooting activities are limited due to air density restrictions caused by higher temperatures and higher elevations and dense vegetation cover, so ground methods are more commonly used.

Requests for assistance with other resources come sporadically throughout the year. Late fall and winter are usually the slowest time of the year for PDM associated with other resources.

East District. The East District is comprised of portions of Custer, Lincoln and Twin Falls counties; Cassia, Minidoka, Blaine, Lemhi and the remaining eastern counties.

During late fall and winter, PDM for the protection of sheep is provided mostly in the central part of the District. Again, all legal methods are used during this time. However, aerial shooting with fixed-wing aircraft is the preferred method because of its selectivity, accessibility, effectiveness and ability to traverse rough terrain during winter weather. In addition, it provides the greatest area of coverage needed to protect livestock resources.

During spring, coyotes inflict the greatest predation losses coinciding with lambing. Therefore, PDM is intensified with all necessary methods including traps, snares, M-44s and shooting being utilized. Aerial shooting is frequently used during the spring.

During summer, PDM to protect sheep is provided at higher elevations in southeastern and eastern parts of the District. There are several sheep and cattle grazing allotments in the Caribou-Targhee, but less sheep allotments in the Salmon-Challis National Forests. All legal methods are used as appropriate.

PDM activities associated with other resources such as property and crops is sporadic throughout the District, but is usually conducted more in the spring and summer.

Unplanned/Emergency Control Areas. Unplanned and emergency PDM may be provided in areas where no control is scheduled in the AWP with the exception of areas designated as restricted for safety or other reasons. The restricted zones are identified by the cooperating agencies during the AWP meetings and noted on maps using a color scheme. Where unanticipated local damage problems arise that threaten human health and safety or property, WS-Idaho may take immediate action to eliminate or curtail the problem upon receipt of a request for assistance provided the proposed control area is not located within a designated restricted activity zone. Emergency PDM activities are handled on a case-by-case basis, as the need arises. WS-Idaho notifies the cooperating agency as soon as practical after the emergency action commences and the work is performed.

Integrated Wildlife Damage Management (IWDM). Before wildlife damage management activities are undertaken, careful assessments are made of the problem and all options for resolving or mitigating the problem. Actions considered and employed should be biologically sound, environmentally safe, scientifically valid, and socially acceptable. The most effective approach to resolving wildlife damage is to integrate the use of several methods simultaneously or sequentially. IWDM, as used and recommended by WS-Idaho, encompasses the integration and application of all approved methods of prevention and management to reduce wildlife damage. The IWDM approach may incorporate cultural practices, habitat modification, animal behavior management, local population reduction or a combination of these approaches. The selection of wildlife damage management methods and their application must consider the species causing the damage and the magnitude, geographic extent, duration, frequency and likelihood of recurring damage. In addition, consideration is given to non-target species, environmental conditions and impacts, social and legal factors, and relative costs of management options (WS Directive 2.105).

The philosophy behind IWDM is to implement effective management techniques in a cost-effective manner while minimizing the potentially harmful effects to humans, target and non-target species and the environment. IWDM draws from the largest possible array of options to create a combination of techniques appropriate for the specific circumstances. It may incorporate cultural practices (i.e., animal husbandry), habitat modification, animal behavior (i.e., scaring), local population reduction or any combination of these depending on the characteristics of the specific damage problems. In selecting management techniques for specific damage situations consideration is given to:

- Species responsible for damage;
- Magnitude, geographic extent, frequency and duration of the problem;
- Status of target and non-target species, including T/E species;
- Local environmental conditions;
- Potential legal restrictions;
- Potential biological, physical, economic and social impacts including impacts on Native American treaty rights;
- Costs of control options[16]; and
- Prevention of future damage (lethal and nonlethal techniques).

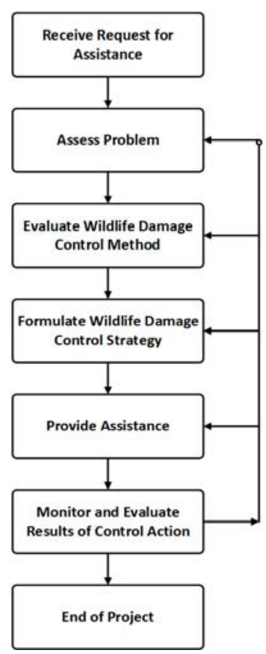

Figure 3-2. APHIS-WS Decision Model.

The WS Decision Making Process. The APHS-WS decision making process is a standardized procedure for evaluating and responding to damage

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

complaints (Slate et al. 1992, WS Directive 2.201; Figure 3-2). WS-Idaho personnel are frequently contacted only after requesters have tried the available nonlethal techniques and found them to be inadequate for alleviating or reducing damage to an acceptable level. WS-Idaho personnel evaluate the appropriateness of different PDM methods in the context of their availability (legal and administrative) and suitability based on biological, economic and social considerations. PDM methods and techniques used or recommended by WS-Idaho are given in Appendix B. Following this evaluation, the methods deemed to be practical for the situation are formed into a management strategy. Once implemented, monitoring is conducted and evaluation continues to assess the effectiveness of the strategy. If the strategy is effective, the need for additional management is ended.

On private property or public lands grazing allotments, predator damage can occur whenever vulnerable livestock are present. This continual threat exists because there is no cost-effective or socially acceptable method or combination of methods to permanently stop or prevent livestock predation. When damage continues intermittently over time, WS-Idaho employees and the resource owner/manager monitor and periodically reevaluate the situation. If one method or combination of methods fails to stop damage, a different strategy is developed and implemented.

In terms of the WS Decision Model (Slate et al. 1992, WS Directive 2.201), most damage management efforts consist of a continuous feedback loop between receiving the request and monitoring the results with the control strategy reevaluated and revised periodically. The cost of IWDM can be secondary in consideration of overriding environmental, legal, human health and safety, animal welfare or other concerns.

The IWDM Strategies Employed by WS-Idaho

Technical Assistance Recommendations (implementation is the responsibility of the requestor). WS-Idaho personnel provide information, demonstrations and advice on many of the available IWDM methods and techniques. Technical assistance includes demonstrations on the proper use of damage management devices (propane exploders, cage traps, etc.) and information and advice on animal husbandry practices, habitat management and animal behavior modification devices. Technical assistance is generally provided by WS-Idaho personnel following an on-site visit or verbal consultation with the requestor. Generally, several management strategies are described to the requestor for short and long-term solutions to damage problems. These strategies are based on the level of risk, the abilities of the requestor, need and practical application. Technical assistance may require substantial effort by WS-Idaho personnel in the decision making process, but the choice to implement recommendations and the actual implementation, management, monitoring and assessing effectiveness is primarily the responsibility of the requestor. Entities are not required to implement WS-Idaho recommendations and may choose to take no action, seek additional guidance or operational assistance from other sources and implement strategies other than those developed with WS-Idaho.

Direct Control Assistance (activities conducted or supervised by WS-Idaho personnel). Direct control assistance is implemented when the problem cannot effectively be resolved through technical assistance and when cooperative service agreements provide for WS-Idaho direct control assistance. The initial investigation defines the nature and history of the problem, extent of damage and the species responsible for the damage. Professional skills of the WS-Idaho personnel are often required to effectively resolve conflicts, particularly when restricted-use pesticides may be required or if the problem is too complex and direct supervision of the wildlife professional is required. WS-Idaho considers the biology and behavior of the damaging species and other factors using the WS Decision Model (Slate et al. 1992, WS Directive 2.201). The recommended strategy(ies) may include any combination of proactive and reactive actions that could be implemented by the requestor, WS-Idaho or other agency personnel, as appropriate. Two strategies are used by WS-Idaho, proactive (preventive) and reactive (corrective) damage management.

- ***Proactive (Preventive) Damage Management.*** Proactive damage management is the application of PDM strategies, including both lethal and nonlethal strategies, prior to damage occurrences in areas with a history of damage problems. As requested and appropriate, WS-Idaho personnel provide information, conduct demonstrations or take action to prevent these historical problems from recurring. For example, in areas where substantial lamb depredation has occurred on lambing grounds, WS-Idaho may provide information about guard animals, carcass removal, penning, shed lambing and herding, among other husbandry techniques and may also be requested to conduct direct control assistance prior to lambing. From FY 2004-2014, WS-Idaho employees recommended various nonlethal strategies to resolve wildlife conflicts to WS-Idaho cooperators in 1,647 instances (MIS 2016). Nonlethal proactive control advice and assistance may be provided for any of the predator species listed above in Section 1.1. Lethal proactive control is only conducted to address depredation by coyotes. WS-Idaho typically conducts these actions where coyote depredations are anticipated due to historical depredations within the same area (e.g., lambing grounds). When this occurs, take numbers of the coyotes prior to damage occurring will normally be similar to the number of take had WS-Idaho waited for damage to occur. Proactive damage management can take place on most lands without special authorization.

  For proactive damage management on federal lands, historical loss areas are reviewed and discussed with representatives of the land management agencies during the AWP process to identify areas where preventive PDM may be planned. In addition, when conducting PDM on federal lands, WS-Idaho must receive a request from the livestock owner or individual that has experienced damage in the past.

- ***Reactive (Corrective) Damage Management.*** Reactive damage management is the application of PDM to stop or reduce current losses. As requested and appropriate, WS-Idaho personnel would provide information and conduct demonstrations or with the appropriate signed agreement, take action to prevent additional losses from occurring. For example, in areas where lamb depredations are occurring, WS-Idaho may provide information about guard dogs, fences or husbandry techniques and conduct direct control assistance to prevent further losses.

Predator Damage Management Methods Available for Use or Recommended Use. Under the current program, WS-Idaho receives requests for assistance from and may enter into cooperative service agreements with private landowners, livestock managers, tribal land managers, cooperating counties, IDFG, ISDA and other federal, State, county and municipal agencies. The methods and techniques used in the current program include 1) technical assistance such as animal husbandry, fencing, frightening devices, chemical repellents and harassment, and 2) direct control methods such as foothold, quick-kill and cage traps, snares, ground shooting, aerial shooting, M-44 (sodium cyanide), gas cartridges, trained dogs, livestock protection collar and DRC-1339. Chemical immobilization and euthanasia and tranquilizer trap devices may also be employed occasionally, but normally only after an animal has been captured and restrained by the use of foothold or cage traps or snares. Detailed descriptions of each method are given in Appendix B. Most PDM methods have recognized strengths and weaknesses relative to each specific predator damage situation. WS-Idaho personnel can determine for each PDM activity what method or combination of methods is most appropriate and effective using the WS Decision Model (Slate et al. 1992, WS Directive 2.201). A number of methods are available for consideration in this process.

<u>Nonlethal Methods.</u> Livestock producers and other resource owner practices consist primarily of nonlethal preventive methods such as animal husbandry and habitat and animal behavior modifications. Producers are encouraged to use these methods, based on the level of risk, need and professional judgment on their effectiveness and practicality (USDA 2002*b*). Many nonlethal predator control practices require daily maintenance and upkeep or require ongoing presence with the resource to be protected and are most appropriately and efficiently implemented by the managers of livestock (e.g., use of livestock guarding animals and herders, night penning, implementing animal husbandry practices, etc.). All livestock producers who receive services from WS-Idaho employ at least some level of nonlethal practices to protect their livestock from predation. Nonlethal PDM assistance by WS-Idaho may include loaning/distributing propane cannons and pyrotechnics to livestock producers to prevent predation; assistance with radio activated guards (RAG) used by WS and loaned to livestock producers where predators with radio collars (e.g., grizzly bears) may be present; and inspection of areas where livestock are kept to harass predators away from the site (e.g., bears). Nonlethal approaches are used much more often than lethal practices in Idaho. WS-Idaho supervisors, wildlife biologists and wildlife specialists are familiar with producer implemented practices based on the information that employees must gain to assess producer needs. The WS Decision Model (Slate et al. 1992, WS Directive 2.201) shows that a predation problem must be assessed before an appropriate strategy for resolution can be developed. A description of livestock

producer employed nonlethal methods has been described by field staff and their supervisors and is contained in Appendix C.

Some methods such as foothold and cage traps and snares can be used as a nonlethal method (e.g., live capture and locate) or lethal method (e.g., capture followed by euthanasia), often depending on the species involved and the circumstances but the vast majority of target predators captured with these methods are euthanized. Target animals are usually not relocated, especially species that are numerous, such as coyotes and striped skunks. Additionally, IDFG policy normally prevents relocating predators that are implicated in causing damage (IDFG 2000, 2014*a*). Furthermore, translocation of wild animals is discouraged by WS policy (WS Directive 2.501) due to the: 1) stress to the relocated animal and poor survival rates due to intraspecific competition and strife with established resident animals of the same species; 2) difficulties of the relocated animal adapting to new locations or habitats; and 3) possibility that the relocated animal would continue to cause problems or depredations at the new site. Relocation of captured problem animals is also opposed by the American Veterinary Medical Association, the National Association of State Public Health Veterinarians and the Council of State and Territorial Epidemiologists because of the risk of disease transmission among wild mammals.

<u>Lethal Methods</u>**.** Lethal control methods are often most appropriately used by WS-Idaho personnel who are trained and certified to use them. In general, the public does not have the capability or the necessary training to safely and efficiently use many of these lethal techniques. However, there are a few individuals that would have the required credentials and skills (see following Section on Actions by Entities Other than WS). These techniques include neck snares, aerial and ground shooting, gas cartridges, quick-kill traps, LPCs and DRC-1339 (e.g., used to control ravens, magpies and crows that depredate upon lambs and cause damage at feedlots). Techniques that are most often used lethally, but are not necessarily lethal depending on how they are applied or used, include foothold traps, cage traps and foot snares.

Actions by Entities Other Than WS. Although many landowners/managers request PDM assistance of WS-Idaho, some individuals and agencies choose to implement PDM actions on their own, or seek the services of private organizations or contractors. Private individuals, agencies and tribes may obtain necessary permits to conduct PDM on their own without WS and, for some State-managed species, no prior permit is required for PDM (see Chapter 1).

All nonlethal techniques and strategies are available for use by non-WS entities except Mesurol, a nonlethal aversive conditioning agent for birds that is restricted to use by WS. Nearly all lethal techniques and strategies are also currently available to non-WS entities, including traps, snares, shooting, and aerial operations (e.g., currently there are 19 permits issued within Idaho for private individuals to conduct aerial shooting operations; S. Boyd, Exec. Dir. Idaho Woolgrowers Assn., pers. comm. 2016). M-44s may be registered for private use, and five other western states have already done so, although they are currently not registered for use by anyone in Idaho other than WS-Idaho employees. Given the relatively low number of coyotes taken using M-44, non-WS entities are likely to compensate for loss of use of M-44s through more extensive use of traps, snares and shooting.

Under this alternative, DRC-1339 is primarily used to reduce livestock and other agricultural losses to ravens, crows and black-billed magpies. These applications of the avicide DRC-1339 are usually restricted to use by WS. However, in 2014, the Idaho State Department of Agriculture (ISDA) issued a special local needs registration (SLN # ID-140005) allowing IDFG personnel to use DRC-1339 to protect federally-designated threatened or endangered species or other species designated to be in need of special protection by federal or State wildlife agencies, or to control the target species within 100 feet of utility poles, electrical line towers, communication towers, or other man-made structures where their activities damage the structures or cause fire threat, threat to human health and safety, or threat to sensitive wildlife species. The SLN label does not include all uses of the product to reduce predation on livestock as may be conducted by WS-Idaho. In 2015, IDFG used DRC-1339 to remove ravens in its study assessing the impacts of local raven population reduction to enhance greater sage-grouse populations.

3.2.2 Alternative 2: No Federal WS-Idaho PDM

This alternative would consist of no WS-Idaho involvement in PDM activities in Idaho. Neither direct operational management nor technical assistance would be provided. Information on future developments in nonlethal and lethal management techniques developed by WS's research branch would not be as readily available to producers or resource owners. Under this alternative, wildlife damage conflicts would most likely be addressed by the IADCB, IDFG, county agencies, private resource owners and managers, private organizations, private contractors or other government agencies.

All but one nonlethal method (Mesurol) and most lethal methods would be available to non-WS entities. M-44s and LPCs, as well as Mesurol as an aversive agent to deter bird foraging on eggs, are currently registered for use only by WS-Idaho personnel or individuals working directly under their supervision in Idaho and would not be available under this alternative. However, LPCs and Mesurol are rarely used in Idaho (last use of an LPC was prior to 1999; last use of Mesurol was approximately 1995 or earlier) and loss of these methods is unlikely to have a substantive impact on PDM conducted by non-WS entities. M-44s are not commonly used by WS-Idaho staff (average 106 coyotes per year – approximately 4% of total annual coyote take by WS FY 2012-FY 2014), and are generally used in situations where coyotes have proven difficult to remove using other methods. M-44s may be registered for private use, and five other western states have already done so, although they are currently not registered for use by anyone in Idaho other than WS-Idaho employees. Given the relatively low number of coyotes taken using M-44, non-WS entities are likely to compensate for loss of use of M-44s through more extensive use of traps, snares and shooting.

The registrations for the avicide DRC-1339 proposed for use in raven, American crow and black-billed magpie damage management in this EA are usually restricted to use by WS.

However, in 2014, ISDA issued a special local needs registration (SLN # ID-140005) allowing IDFG personnel to use the product in some, but not all of the situations where it could be used by WS-Idaho (see Alternative 1 above for details). Based on information presented in Chapter 4, for FY 2011-2014, WS-Idaho's average take of ravens, magpies and crows to reduce agricultural damage including depredation on livestock was 141 ravens, 83 magpies, and 13 crows per year. The only other take of these species by WS-Idaho was an annual average of four ravens per year using firearms. In the absence of access to DRC-1339, individuals seeking to use lethal methods to remove ravens, crows or magpies would need to resort to more labor intensive methods such as shooting and live-capture and euthanasia. Average annual reported take by non-WS entities (without use of DRC-1339) for the same period was 22 crows, 127 magpies and 40 ravens. Given the relatively low level of take of these species and the reported levels of take by non-WS entities, it seems likely that non-WS entities have the capability to take similar numbers of crows, magpies and ravens as WS-Idaho under the current program even without access to DRC-1339. Use of DRC-1339 by IDFG is anticipated to continue as under Alternative 1.

Approximately 55% of the funding for WS-Idaho PDM actions in the State comes from federal appropriations to WS-Idaho. If WS-Idaho were discontinued, there would likely be an initial decrease in overall organized PDM efforts. However, because of the importance of PDM to livestock producers, it is likely that alternative systems for funding PDM in the state would be established. As a case study - Congress eliminated funds for WS-South Dakota in 2013, which left just enough to operate a fixed-wing aircraft. The State responded by legislating a $1 increase in license tag sales to generate over $300,000 to be used by the State's game department to conduct the work that was halted when federal funds were lost. If this were to occur in Idaho, the State would need to generate approximately $687,000 annually to match those funds expended by WS-Idaho to conduct PDM activities within the State. The State could also respond to the loss of WS-Idaho PDM funding by working administratively to assist private PDM efforts including facilitating permitting for PDM (where applicable) or by helping to coordinate volunteers to assist producers with lethal removal of depredating animals similar to the system that was implemented in Minnesota to help with predator damage management issues in their State.

In the event that WS-Idaho PDM assistance is eliminated, it is probable that some non-agency personnel and resource owners/managers would try to use PDM methods in an unsafe and improper manner, such as the illegal use of pesticides.

3.2.3 Alternative 3: Nonlethal Management Only

This alternative would allow WS-Idaho to provide technical information and operational assistance with nonlethal control techniques, such as guard dogs, frightening devices, chemical repellents, harassment, fencing, exclusion, animal husbandry, modification of human behavior, habitat modification and some use of cage traps and immobilization where relocation is an option. WS-Idaho would also loan equipment used for nonlethal control.

Information and training on lethal control methods would not be provided or used by WS-Idaho.

As with Alternative 2, we would expect an initial decline in lethal PDM by non-WS entities in the early years of implementation of this alternative while systems become established to provide lethal PDM services no longer available through WS-Idaho. Individuals experiencing predator damage would still have access to nonlethal and lethal PDM methods as allowed under applicable State, federal and tribal laws. Under this alternative, aircraft and associated funding and staff would be transferred to other WS state programs. The federal funding for the aerial component of the current WS-Idaho operations would not be "freed" for other WS-Idaho activities, and remaining federal funding for implementation of an operational program would remain as for Alternative 1. It is unclear whether the non-WS entities that currently provide approximately 45% of the funding for PDM would continue to support WS-Idaho. Given that many livestock producers in Idaho feel that an integrated program that includes lethal methods is important for effective resolution of their conflicts, these entities may choose to allocate all funds to a different entity(ies) that could provide an fully integrated program or just assist with lethal methods not available from WS.

All nonlethal methods would be available under this alternative. As with Alternative 2, most lethal methods would also be available to non-WS entities. The experience level of individuals conducting lethal PDM would vary. Lethal PDM methods and control devices could be applied by persons with little or no training or experience. As discussed in 3.2.2 some lethal PDM methods could be used improperly because of the frustration of resource owners. M-44s and LPCs are registered for use by WS personnel or individuals working directly under their supervision and would not be available under this alternative. However, M-44s may be registered for private use, and five other western states have already done so, although they are currently not registered for use by anyone in Idaho other than WS-Idaho employees. Given the relatively low number of coyotes taken using M-44, non-WS entities are likely to compensate for loss of use of M-44s through more extensive use of traps, snares and shooting. LPCs and Mesurol are rarely used in Idaho (last use of an LPC was prior to 1999; last use of Mesurol was approximately 1995 or earlier), and loss of these methods is unlikely to have a substantive impact on PDM conducted by non-WS entities. M-44s are not commonly used by WS-Idaho staff (average 106 coyotes per year - 4% of total annual coyote take by WS-Idaho FY 2012-FY 2014), and are generally used in situations where coyotes have proven difficult to remove using other methods. Given the relatively low number of coyotes taken using M-44, non-WS entities are likely to compensate for loss of M-44s through more extensive use of traps, snares and shooting.

As noted for Alternative 2, use of DRC-1339 is usually restricted to WS. However, in 2014, ISDA issued a special local needs registration (SLN # ID-140005) allowing IDFG personnel to use the product in some, but not all of the situations where it could be used by WS-Idaho (see Alternative 1 above for details). Use of DRC-1339 for livestock depredation management as currently conducted by WS-Idaho would be discontinued. However, based on information presented in Alternative 2, non-WS entities are likely to be able to make up for most of the take of ravens, magpies and crows by WS-Idaho under Alternative 1 by using other methods and the IDFG would still hold their special local needs registration of DRC-1339 that remains available for them to use for this purpose..

3.2.4 Alternative 4: Nonlethal Required before Lethal Control

This alternative would require that: 1) livestock grazing permittees, landowners or resource managers show evidence of sustained and ongoing use of nonlethal or husbandry techniques aimed at preventing or reducing predation prior to receiving WS-Idaho assistance with lethal PDM methods; 2) employees of WS-Idaho use or recommend appropriate nonlethal techniques in response to a confirmed damage situation prior to using lethal methods; and 3) lethal techniques be used only when the use of husbandry or nonlethal techniques had failed to keep livestock losses below an acceptable level as indicated by the cooperator. Lethal preventive predation management for livestock protection would not be conducted under this alternative. Producers and the general public would still have the option of implementing lethal control measures on their own and WS-Idaho would continue to recommend lethal control when and where appropriate.

3.2.5 Alternative 5: Modified Current Federal WS-Idaho PDM Program (Proposed Alternative)

Under this alternative, WS-Idaho would continue PDM activities for the protection of livestock and other agricultural resources, property and human health and safety in the same manner as for Alternative 1. As with Alternative 1, under this alternative WS-Idaho could respond to IDFG requests to conduct coyote predation management for the protection of mule deer, as well as, skunk, raccoon, red fox, feral cat and coyote damage management to protect nesting waterfowl, as has occurred in the past. However, under this alternative WS-Idaho would also be able to respond to additional requests for PDM assistance from IDFG and the USFWS. Anticipated changes in impacts on the human environment from potential increases in PDM activities are analyzed under this alternative. Some of the new PDM projects that Idaho might be requested to assist with are discussed below. However, this is not a comprehensive list, natural resource management agencies could request WS-Idaho assistance with all, a subset or none of the projects listed below, or they could request assistance with other types of natural resource protection projects, so long as the methods used and cumulative impacts of the projects fall within the parameters analyzed in this EA. In all cases, the determination of whether PDM is warranted for protection of other wildlife species is made by the IDFG, USFWS or tribal natural resource management agency charged with management of the relevant wildlife populations, not WS-Idaho. WS-Idaho's decision in these situations is whether or not to participate in the proposed action as requested by the lead agency.

If this alternative is selected, WS-Idaho anticipates becoming involved in IDFG efforts to enhance greater sage-grouse populations by reducing predation by ravens. Black-billed magpies and American crows have not been implicated as sage-grouse nest or chick predators to the extent that ravens have and control efforts would not be specifically targeted at magpies and crows. But the DRC-1339 treated egg baits exposed for raven control could also kill magpies and crows if consumed by those species. In the case of projects to reduce predation on eggs of sage grouse, magpies or crows killed with DRC-1339 egg baits would be considered target animals because they were preying on eggs in sensitive sage-grouse areas. Bobcats have also been implicated as sage-grouse nest and chick predators, but because bobcat densities are typically much lower than densities of other sage-grouse predators (coyotes, badgers and red foxes) that might be targeted (see discussion on various species populations in Chapter 4), they do not likely present as much of a threat to sage-grouse. The methods used in conducting these predator control efforts might potentially include any of the methods discussed under the description of the Current Program, with the exception of M-44s and the LPC. Use of M-44s would be allowed only if the wildlife species to be protected is federally listed as a T/E species, and would not be at risk from the use of M-44s.

Another area of potentially expanded PDM activities may be increased efforts to help protect northern and/or southern Idaho ground squirrels from predation. These efforts would target primarily badgers, but also any coyotes or red fox in the vicinity of sites where the USFWS has requested WS-Idaho to conduct predator control for protection of these species. These activities have historically occurred at times between April-August on a total of as many as 25 dispersed sites of 6-8 mi^2 each where remnant populations of these species still exist in Adams County (for the northern Idaho ground squirrel) and in the low rolling hills and valleys along the Payette River in Gem, Payette and Washington Counties (for the southern Idaho ground squirrel). The actual size of each site inhabited by these ground squirrels is typically no more than several acres, but predation management efforts would potentially occur on lands within about a 1.5 mile radius of each site. Rationale for the size of treatment areas for ground squirrel protection is based on documented territory size for badgers ranging from about 0.65 mi^2 (Messick and Hornocker 1981) up to about 2.25 mi^2 (Lindzey 1978) and documented daily movements outside of territories of up to 1.3 miles (Lindzey 1978). WS-Idaho could also receive requests from other federal natural resources agencies having species-specific management responsibilities through law or other mandated authority.

There has also been interest in the past by IDFG for WS-Idaho to conduct selective mountain lion predation management to protect California bighorn sheep in the Jim Sage Mountain area of southern Idaho where they were reintroduced in 2004. IDFG could also request WS-Idaho to provide PDM for the protection of pronghorn antelope and other wildlife species designated as needing special protection.

3.2.6 Summary of Alternatives

The five alternatives would allow the use of different PDM methods. The methods that could be used under the different alternatives are summarized in Table 3-1.

Table 3.1. Summary of PDM methods and tools which would be authorized for use or recommendation by WS-Idaho under each of the alternatives.

Control Method	Alternative 1 Current WS-Idaho PDM Program	Alternative 2 No Federal PDM	Alternative 3 Nonlethal Only	Alternative 4 Nonlethal before Lethal	Alternative 5 Modified Current WS-Idaho PDM Program
Animal Husbandry	X		X	X	X
Habitat Modification	X		X	X	X
Predator-proof Fencing	X		X	X	X
Temporary Fencing	X		X	X	X
Electronic Guard	X		X	X	X
Propane Exploders	X		X	X	X
Chemical Repellents	X		X	X	X
Guarding Animals	X		X	X	X
Pyrotechnics	X		X	X	X
Lights	X		X	X	X
Harassment	X		X	X	X
Foothold Traps	X		X[1]	X	X
Quick-kill Traps	X			X	X
Cage Traps	X		X[1]	X	X
Snares	X		X[1]	X	X
Ground Shooting	X			X	X
Aerial Shooting	X			X	X
Trained Dogs	X			X	X
Denning	X			X	X
M-44	X			X	X
Gas Cartridge	X			X	X
Livestock Protection Collar	X			X	X
DRC-1339	X			X	X
Mesurol	X		X	X	X
Chemical Immobilization	X		X	X	X
Chemical Euthanasia	X			X	X
Egg, Nest, Hatchling Dest.	X			X	X
Egg Addling/Oiling	X			X	X

[1] This method would only be used if the animal was to be live-captured and released on site or relocated and released alive.

3.3 ALTERNATIVES CONSIDERED BUT NOT ANALYZED IN DETAIL

Several alternatives were considered but not analyzed in detail. These were not considered because of problems associated with their implementation as described below.

3.3.1 Monetary compensation for predator damage losses

As described in the Section 1.3.2, IDFG pays partial compensation for confirmed predation on livestock from black bears and mountain lions only or when these predators damage berries or honey on private land. IDFG would only provide such payment for damage caused by grizzly bears if or where they are removed from the list of species protected under the ESA. Claims must exceed $1,000 in value, and the landowner must have provided reasonable access for hunting, to be eligible for compensation. A $1,000 deductible is applied to all claims, except for crop losses that occur in subsequent years in the same location where the IDFG was unable to prevent damage following the first occurrence. During the past 10 years, $2.45 million has been paid for 304 claims. Crop losses account for 91% of payments, while livestock and rangeland forage payments account for 6% and 3%, respectively (IDFG 2016).

The Agricultural Act of 2014 (aka Farm Bill) has provisions to provide indemnity payments through the USDA-Farm Service Agency to eligible producers on farms that have incurred livestock death losses in excess of the normal mortality, as determined by the Secretary, due to attacks by animals reintroduced into the wild by the federal government or protected by federal law, including wolves and avian predators. Payments are equal to 75% of the market value of the applicable livestock on the day before the date of death. For purposes of this EA, the 2014 Farm Bill could provide indemnity payments for livestock losses to grizzly bears (while federally protected under the ESA), eagles, ravens, magpies and crows.

Although the compensation programs listed above are helpful, data from NASS livestock loss reports indicates that known losses to grizzly bears, eagles, ravens, magpies and crows comprised only a small portion of total livestock losses to predators (less than 12% of sheep, 6% of lambs, 5% of cattle and 8.3% of lamb losses (Tables 1.2 and 1.3)). In contrast, there is no compensation program for losses to coyote predation which accounted for 63% of sheep losses, 86% of lamb losses, 4% of cattle losses and 27% of calf losses.

The Compensation Alternative would require the establishment of a system to reimburse resource owners for predation or other losses. This alternative was eliminated from further analysis, in part, because no federal or State laws currently exist to authorize expenditure of funds that are appropriated for WS-Idaho for this purpose. Under such an alternative, WS-Idaho would not provide any direct control or technical assistance.

- It would require larger expenditures of money and labor to investigate and validate all losses and determine and administer appropriate compensation.

- It would be difficult, if not impossible, to assess and confirm losses in a timely manner for all requests and, therefore, many losses could not be verified and compensated. Additionally, compensation would most likely be below full market value.

- Compensation would give little incentive to livestock and other resource owners to limit predation or damages with PDM strategies such as improved animal husbandry practices and fencing. Some authors have raised concerns that compensation programs may make producers less risk-averse and less likely to adopt new or improve existing management practices (Nyhus et al. 2003).

- Not all ranchers would rely completely on a compensation program and PDM activities including lethal control would likely continue as permitted by State law. In the absence of changes in State requirements for reporting of PDM take, information and opportunities for public and tribal involvement in PDM for many species would be substantially reduced, similar to the situation in Alternative 2 and reports by Larson (2006) for the Marin County Program.

- Reviews of compensation programs indicate that these programs do not generally improve tolerance of the species causing damage (Naughton-Treves et al. 2003) and do not address indirect costs of wildlife damage (Steele et al. 2013).

- Compensation programs for recovering wildlife species can, in some cases, increase to the point where funds needed for compensation undermine budgets for conserving other species (Treves et al. 2009).

Because of the limitations of this proposed alternative, WS-Idaho is not considering it in detail.

3.3.2 Bounties

Payment of funds for killing predators (bounties) suspected of causing economic losses is not supported by Idaho State agencies such as IDFG. WS-Idaho also does not support bounties because of the following:

- Bounties are generally not effective in controlling damage, especially over a wide area such as Idaho. However, the Utah Division of Wildlife Resources (UDWR) manages a predator control program that pays a $50 bounty for each coyote killed. This program has apparently shown some levels of success since it has been in place for several years with continued funding from UDWR.

- Circumstances surrounding the take of animals are typically arbitrary and completely unregulated.

- No process exists to prevent paying for animals from outside the damage management area.

WS-Idaho does not have the authority to establish a bounty program.

Because of the limitations of this proposed alternative, WS-Idaho is not considering it in detail.

3.3.3 Transfer of present WS-Idaho PDM activities to private contractors

This alternative would transfer WS-Idaho PDM activities to the private sector through awarding and issuing contracts. WS-Idaho would not conduct any direct control or provide technical assistance and would only perform contract oversight for private contractors who would provide PDM activities. All legally available methods and tools would be authorized in contracts. The same federal appropriation currently available to WS-Idaho would probably achieve less PDM because some federal employees would still be required to administer and monitor efficacy of the private contracts in solving predation problems.

Some elements of the current WS-Idaho PDM program would be retained, but the primary difference is that the PDM activities would be conducted by private contractors under the same wildlife and environmental protection laws and regulations. Environmental impacts would be similar to those of the current WS-Idaho operations with the exception that private contractors would not be able to use Mesurol, M-44s, LPCs or DRC-1339 products.

Furthermore, private contractors would not be required to comply with NEPA (i.e., they will not be preparing EAs or EIS'), nor would their take be reported online for public review as is done by WS-Idaho.

Because of the limitations of this proposed alternative, WS-Idaho is not considering it in detail.

3.3.4 Transfer present WS-Idaho PDM activities to IDFG, ISDA or ISADCB (State Agencies)

This alternative would transfer WS-Idaho PDM activities, including funding, to the IDFG, ISDA or ISADCB and would involve all field and administrative activities, including technical assistance and direct control, with the exception of the use of Mesurol, M-44s, and LPCs. As noted above, ISDA issued a special local need registration (SLN # ID-140005) allowing IDFG personnel to use DRC-1339 in some, but not all of the situations where it might be used by WS-Idaho under this EA – depending on the alternative selected. The IDFG, ISDA or ISADCB would receive full or partial federal funds currently appropriated for WS-Idaho. However, in order for this transfer to occur, the IDFG, ISDA or ISADCB would have to have the authority to perform these duties and be willing to assume these responsibilities and activities.

It is predicted that a transfer would result in minor changes in PDM activities and the cost of this alternative is estimated as equal to current WS-Idaho operations. Some elements of the current WS-Idaho PDM program would be retained, but the primary difference is that PDM activities would not be conducted by IDFG, ISDA or ISADCB employees or contractors under the same wildlife and environmental protection laws and regulations. Specifically, PDM actions conducted by State agencies are not subject to review and public comment under NEPA. State agencies also do not have the same trust obligations to Native American tribes as federal agencies, so there may be some reductions in outreach, consultation and coordination with tribes under this alternative. Environmental impacts would be similar to those of the current WS-Idaho operational activities.

Because of the limitations of this proposed alternative, WS-Idaho is not considering it in detail.

3.3.5 Eradication and long term population suppression

An eradication alternative would direct all WS-Idaho efforts toward total long term elimination of predator populations wherever cooperative service agreements were initiated in Idaho. The eradication of predator species is not a desired goal of Idaho State agencies. However, coyotes, striped and spotted skunks, weasels and raccoons are classified as Unprotected and Predatory Wildlife and may be taken in any amounts and at any time of the year by holders of the appropriate valid Idaho hunting, trapping or combination hunting license. This is allowed because current population levels of these species can sustain this level of take without irreparable consequences. Some individuals may prefer that select species of predators be eradicated, however, eradication as a general objective for PDM will not be considered by WS-Idaho in detail because:

- WS-Idaho opposes eradication of any native wildlife species;
- IDFG, ISDA, USFWS, BLM, USFS and the Native American tribes in the State oppose eradication of any native wildlife species;
- The eradication of a native species or local population eradication would be extremely difficult, if not impossible, to accomplish and cost-prohibitive in most situations; and
- Eradication is not acceptable to most members of the public.

Suppression would direct WS-Idaho efforts toward managed population reduction of certain problem populations or groups. In localized areas where damage can be attributed to predation by specific groups, IDFG has the authority to increase hunting seasons and hunter tag quotas, and to issue depredation permits. When a large number of requests for PDM are generated from a localized area, WS-Idaho could consider suppression of the local population or groups of the offending species, if appropriate and cost effective and if specifically requested. Typically, WS-Idaho suppression activities would be conducted on a very small portion of the sites or areas inhabited or frequented by problem species.

Because of the limitations of this proposed alternative, WS-Idaho is not considering it in detail.

3.3.6 No predator control within any wilderness, proposed wilderness or WSAs

Under current WS-Idaho operations (Alternative 1) and proposed WS-Idaho operations (Alternative 5), the amount of PDM activities that would occur in wilderness, proposed wilderness and WSAs is so minor that the effects of either of those alternatives would not likely be significantly different from the effects of a "No Control in Wilderness Areas" alternative. Some WSAs in Idaho have historic grazing allotments. WS-Idaho has conducted limited PDM for the protection of livestock and natural resources within these areas. The minor amount of PDM activities that are or could be conducted by WS-Idaho in wilderness, proposed wilderness, or WSAs conforms to legislative and policy guidelines as administered by the responsible land management agency. WS-Idaho and the land management agency meet annually to review work plans that delineate what, when, why and where PDM would be conducted. For example, in BLM wilderness and WSAs, WS-Idaho uses the minimum control necessary when conducting wildlife damage control activities. And to the extent possible, the control of wildlife causing livestock loss is limited to the individual(s) causing the damage and such control activities would not diminish wilderness values. See Appendix B for a list of actions and methods WS could use on public lands including wilderness and WSAs if approved by the applicable land management agency.

Because of the limitations of this proposed alternative, WS-Idaho is not considering it in detail.

3.3.7 WS-Idaho should use lithium chloride as an aversive agent

This alternative would require WS-Idaho to use lithium chloride to prevent predation on livestock. Lithium chloride has been tested as a taste aversion agent to condition coyotes to avoid livestock, especially sheep. Despite extensive research, the efficacy of this technique remains unproven (Conover et al. 1977; Sterner and Shumake 1978; Burns 1980, 1983; Burns and Connolly 1980, 1985; Horn 1983; Johnson 1984). 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, 1982; Ellins and Martin 1981; Forthman-Quick et al. 1985*a*, 1985*b*), while other studies have shown lithium chloride to be ineffective especially in field situations (Conover et al. 1977; Burns 1980, 1983; Bourne and Dorrance 1982; Burns and Connolly 1985) and controlled experiments (Sterner 1995). The General Accounting Office (GAO) (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. Therefore, at the time this EA was developed, lithium chloride could not be used to prevent predation. If a product containing lithium chloride becomes available to manage damage and if the product has been proven effective in reducing predation rates, the use of the lithium chloride could be evaluated as an available method that could be used to managing damage. Also, if WS-Idaho decided to use such a product containing lithium chloride, WS-Idaho would update its NEPA analysis accordingly.

3.3.8 Immunocontraceptives or sterilization should be used instead of lethal predator control

Contraceptive measures for mammals can be grouped into four categories: surgical sterilization; oral contraception; hormone implantation; and immunocontraception (the use of contraceptive vaccines). These techniques would require that each individual animal receive either single, multiple or possibly daily treatment to successfully prevent conception. The use of oral contraception, hormone implantation or immunocontraception would be subject to approval by federal and State regulatory agencies.

These methods were not analyzed in detail in the EA because: (1) surgical sterilization would require that each animal be captured and sterilization conducted by licensed veterinarians and would therefore be extremely labor intensive and expensive; and (2) there are not currently any federally or State approved chemosterilants available for operational use in predator control.

Bromley and Gese (2001*a*, 2001*b*) conducted studies to determine if surgically sterilized coyotes would maintain territorial and pair bond behavior characteristics of intact coyotes and if predation rates by sterilized coyote pairs would decrease. Their results suggested that behaviorally, sterile coyote pairs appeared to be no different than intact pairs except for predation rates on lambs. Reproductively intact coyote packs were six times more likely to prey on sheep than were sterilized packs (Bromley and Gese 2001*b*). They 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 enough alpha (breeding) pairs could be captured and sterilized. During Bromley and Gese's (2001*a*, 2001*b*) studies: (1) they captured as many coyotes as possible from all packs on their study area; (2) they controlled coyote exploitation (mortality) on their study area and survival rates for coyotes were similar to those reported for mostly unexploited coyote populations, unlike most other areas; and (3) they concluded a more effective and economical method of sterilizing resident coyotes was needed to make this a practical management tool on a larger scale (Bromley and Gese 2001*b*).

As alternative methods of delivering sterilants are developed, sterilization may prove to be a more practical tool in some circumstances (DeLiberto et al. 1998). Reduction of local populations could conceivably be achieved through natural mortality combined with reduced fecundity. No predators would be killed directly with this method, however, and treated predators could continue to cause damage. Populations of dispersing predators would probably be unaffected.

Potential environmental concerns associated with the use of chemical sterilization would still need to be addressed, including safety of genetically engineered vaccines (typically used with the chemical sterilizing agent) to humans and other wildlife. At this time, chemical sterilization is controversial among wildlife biologists and many others. In any event, no contraceptive agents or methods are currently registered and are thus not legal for use or practical for use on predators in most areas. Should any become registered in the future, WS-Idaho could consider them among the methods to be used in their program. Any additional NEPA analyses deemed necessary at that time would be conducted. The use of contraceptives is not realistic at this point, since effective and legal methods of delivering contraceptives to predators are not yet available for operational use.

Nonlethal taste aversion techniques should be considered as an alternative to lethal predator control. Avery et al. (1995) evaluated the use of methiocarb (i.e., Mesurol) treated eggs as an aversive conditioning measure to reduce raven predation on California least tern (*Sterna antillarum browni*) eggs and concluded that this could be a feasible method of protecting this species from raven predation. California least terns are a colonial nesting species, with nesting colonies typically involving high densities of birds in relatively small areas. This made it relatively easy to ensure that most ravens in the local area were exposed to treated egg baits prior to initiation of nesting by least terns. Sage-grouse, on the other hand, are highly dispersed nesters and occur at relatively low densities over expansive nesting habitats. Avery et al. (1995) found that if a raven consumed a number of Mesurol-treated egg baits and began developing a taste aversion, but then consumed an untreated egg (which did not make the raven ill), that predation would resume. In order for this aversive conditioning approach to be effective, it would be important that: 1) treated egg baits be very similar in appearance to sage-grouse eggs; 2) that treated egg baits be widely distributed and maintained in adequate quantities throughout the treatment area so as to ensure exposure; and, 3) that ravens or other predators not have an opportunity to eat any untreated sage-grouse eggs, which would likely begin negating any aversion that may have been established. Even if it were possible to obtain enough eggs that were similar enough in appearance to sage-grouse eggs and to distribute them widely enough and in great enough quantities to ensure bait consumption, it would still be impossible to prevent predators from finding and "testing" actual sage-grouse eggs.

But the primary reason for not implementing nonlethal taste aversion technique as an alternative to lethal control is that even if predators could be successfully conditioned not to consume sage-grouse eggs, it would do nothing to prevent predation on sage-grouse chicks, which appears to be a much more significant problem than nest predation.

3.3.9 Management activities would only be conducted after damage had occurred

Impacts of an alternative in which lethal preventive predation management is not conducted for livestock protection are considered in Alternative 4. This proposal would preclude all preventive predation management. 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). This management strategy could be used under Alternatives 1, 3, 4 and 5. As requested and appropriate, WS-Idaho would provide information, conduct demonstrations or take action to prevent damage from recurring. For example, in areas where substantial lamb depredation has occurred on lambing grounds, WS-Idaho could provide information about guard dogs, fences or other husbandry techniques or be requested to provide direct operational assistance to remove predators. 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). This management strategy could be used under Alternatives 1, 3, 4 and 5. Under a reactive damage management only alternative, WS-Idaho would only provide reactive assistance and only conduct activities after damage has occurred and no proactive assistance would be provided. WS-Idaho would only conduct activities based on a request for assistance. In some situations, proactive damage management is already prohibited or not agreed to (*e.g*., proactive management cannot occur on the Wilderness Study Areas managed by the BLM).

This alternative would preclude all preventive predation management including technical assistance on strategies that reduce the risk that predation would occur. Blocks on such strategies would be counterproductive and would likely result in increases in the total amount of predators taken during reactive damage management. Implementation of this alternative would also preclude PDM to prevent excessive predation on sensitive species based on damage identified until such time as actual losses to predators have been documented again and would significantly impair the ability of WS-Idaho to respond to the need for action. Most actions to address risks to human health, and safety (e.g., disease transmission) are preventive by nature, because waiting for adverse impacts to happen before action is taken is usually undesirable. WS-Idaho would not be able to participate in PDM actions to monitor for or prevent risks to human health and safety under this alternative.

Because of the limitations of this proposed alternative, WS-Idaho is not considering it in detail.

3.3.10 Live-capture and translocate predators only

Under this alternative, all requests for assistance would be addressed using live-capture methods or the recommendation of live-capture methods. Predators would be live-captured using primarily immobilizing drugs, cage traps, culvert traps, foothold traps and restraining cables. All predators live-captured through direct operational assistance by WS-Idaho would be translocated. Translocation sites would be identified and have to be approved by the IDFG and the property owner or public land manager where the translocated predators would be placed prior to live- capture and translocation.

Generally, translocating predators that have caused damage to other areas following live-capture would not be effective or cost-effective. Translocation is generally ineffective for predators that are highly mobile and can easily return to damage sites from long distances. Good quality habitat in other areas is generally already occupied, which contributes to stress and risks to translocated and resident animals and poor survivorship of translocated individuals. Depending on the relocation site, translocation often results in damage problems at the new location. In addition, for some projects, multiple animals would need to be captured and translocated to solve the damage problems which would increase the cost and create logistics obstacles. Translocation of wildlife is also discouraged by WS policy (see WS Directive 2.501) because of the stress to the translocated animal, poor survival rates, threat of spreading diseases and the difficulties that translocated wildlife have with adapting to new locations or habitats (Nielsen 1988). Based on those factors and the availability of additional methods that could be used to effectively resolve damage or threats of damage, this alternative was not evaluated in detail.

Although this alternative is not discussed in detail, translocation has been included as a method to be used as part of IWDM processes in any of the alternatives analyzed in detail, except for the no involvement by WS-Idaho alternative (Alternative 2). However, other entities could translocate predators under Alternative 2. Translocation is most likely to be used for low-density, high-value species such as grizzly bears and bald and golden eagles.

Because of the limitations of this proposed alternative, WS-Idaho is not considering it in detail.

3.3.11 Lethal only program

Under this Alternative WS-Idaho would only provide technical and operational assistance with lethal damage management techniques. Prohibiting WS-Idaho from using or providing technical assistance on effective and practical nonlethal PDM methods is not consistent with an IWDM approach in resolving predator problems and is contrary to agency policy and directives (WS Directive 2.101). For example, the use of guard dogs can be effective at reducing predation rates or installing proper fencing can exclude some predators from areas. Such a restriction on WS' ability to properly consider all available techniques and strategies to IWDM is not appropriate and will not be analyzed further. In certain situations, nonlethal methods may provide a more effective short-term or long-term solution to PDM problems than lethal methods.

3.3.12 Technical assistance only

Under this alternative, WS-Idaho would only provide technical assistance to all people requesting assistance, including other State and federal agencies, and tribes. Technical assistance includes the sharing of knowledge (e.g., phone conversations, leaflets, educational programs, site visits to confirm the species responsible for the damage, etc.) and the sharing of equipment and supplies on a limited basis (e.g., equipment that would have a short duration of use by the requestor (e.g., propane exploders) or provided for demonstration purposes only (e.g., pyrotechnics)). WS-Idaho would refer people requesting assistance beyond technical assistance to those State and federal agencies (e.g., IDFG, ISDA, USFWS) with the appropriate management authority. WS-Idaho would continue to provide technical assistance as described in Alternatives 1, 3, 4, and 5.

Similar to the other alternatives, WS-Idaho could receive requests for assistance from community representatives, private individuals/businesses or from public entities. Technical assistance provided by WS-Idaho would provide those people experiencing damage or threats caused by 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 Idaho-WS. Although WS-Idaho could not provide direct operational assistance, WS-Idaho may provide supplies or materials that were of limited availability for use by private entities (*e.g.*, loaning of propane cannons). Technical assistance could be provided through a personal or telephone consultation or during an on-site visit with the requester. Generally, several management strategies would be described by WS-Idaho to the requester for short and long-term solutions to managing damage. Those strategies would be based on the level of risk, need and the practicality of their application. WS-Idaho would use the WS Decision Model to recommend those methods and techniques available to the requester to manage damage and threats of damage. Those people receiving technical assistance from WS-Idaho could implement those methods recommended; could employ other methods not recommended by WS-Idaho; could seek assistance from the IDFG and ISDA; could seek assistance from other entities; or could take no further action.

Under a technical assistance only alternative, WS-Idaho would recommend an integrated approach similar to Alternatives 1, 4 and 5 when receiving a request for assistance; however, WS-Idaho would not provide direct operational assistance under this alternative. Recommendation of methods and techniques by WS-Idaho to resolve damage would be based on information provided by the individual seeking assistance using the WS Decision Model. In some instances, wildlife-related information provided to the requestor by WS-Idaho would result in tolerance/acceptance of the situation. In other instances, damage management options would be discussed and recommended. Only those methods legally available for use by the appropriate individual would be recommended or equipment loaned by WS-Idaho. Similar to the other alternatives, some of the methods described in Appendix C would be available to those people experiencing damage or threats associated with predators, except for M-44s, Mesurol, tranquilizer Trap Devices and some uses of DRC-1339 (i.e., the IDFG currently holds a 24c registration to use DRC-1339 for livestock and egg/nest/fodder depredation that would still be available to them to use) and immobilizing drugs and euthanasia chemicals (note that these drugs and chemicals are available to many IDFG personnel and would remain available to them under this alternative). Aerial and ground shooting, gas cartridges, egg (including nest and hatchling) removal and destruction, egg addling/oiling, use of foothold traps and quick-kill traps, snares, and use of trained dogs would be available for the publics' use, but may require the applicator to obtain special licensing, permits, certifications or authorization from federal or State regulatory agencies.

WS-Idaho would regularly provide 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-Idaho 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 federal and State governmental agencies and/or private businesses. Those persons experiencing damage or were concerned with threats posed by predators could seek assistance from WS-Idaho, other governmental agencies, private entities or conduct damage management on their own. Those people 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.

Without WS direct assistance available, some requestors, even with the information needed to do the work themselves, are not physically (e.g., the aged or handicapped), economically, emotionally (e.g., some have a fear of snakes or handling wild animals themselves), or equipped to resolve the conflict themselves. And, even with proper instruction, the use of control strategies may be implemented incorrectly and may pose greater risks to the animals, the environment, the general public, and to themselves than when implemented by trained and skilled personnel.

Because of the limitations of this proposed alternative, WS-Idaho is not considering it in detail.

3.3.13 WS-Idaho conducting PDM on private property verses public lands

There is some concern from the public about how PDM activities would be conducted on private property verses public lands. WS-Idaho PDM activities on private property are carried out only after the landowner or manager has requested assistance from WS-Idaho and after an *Agreement for Control* has been signed by both parties. This agreement stipulates which methods may be used on the property. PDM activities on public lands are only carried out after development of site specific work plans between WS-Idaho and the respective land management agencies. These plans stipulate any restrictions that may be deemed necessary to ensure public safety or resource protection on those public lands. WS-Idaho's PDM activities on public lands are typically carried out under more restrictions than on private property in order to mitigate the likelihood of conflicts with users of public lands.

3.3.14 WS-Idaho adopt an experimental, exclusively nonlethal predator control program for a 5-year period similar to the "Marin Program" in Marin County, California

Following public controversy over the use of lethal methods to control coyote predation, the Marin County, California Board of Supervisors replaced a cooperative program with the California Department of Food and Agriculture and WS-California with a county-administered, nonlethal program supervised by the County Agricultural Commissioner. Under the current nonlethal Marin County Program, qualified ranchers are provided funding to assist in the implementation of nonlethal management methods to reduce depredation (e.g., through new fence construction or improvements to existing fences, guard animals, scare devices or changes in animal husbandry (Larson 2006)). The program is a cost share program to provide funds for purchasing fencing materials and guard animals (Larson 2006). To qualify for the program, ranchers must have at least 25 head of livestock and must utilize two nonlethal methods to deter predation verified by the Marin County Agricultural Commissioner.

Initially, producers who qualified for the program could receive compensation for livestock lost to predation. However, the program was unable to pay the cost of all losses to predation and in 2003, compensation payments were capped at 5% of the number of adult animals in the herd. However, when the Marin County Department of Agriculture was asked for records reflecting whether and to what extent the Program addresses or pays for the depredation of or damage caused by wild animals commonly found in California in a December 2014 California Public Records Request (e.g., coyotes, mountain lions, feral swine (aka wild hogs and boars), feral and free roaming dogs, gray fox, striped or spotted skunks, opossums and other wild animals), the county indicated the Livestock Protection Program was only a cost share program to provide limited funds for purchasing fencing materials and guard animals. Producers who participate in the program commonly use guard dogs and fences as their main means of livestock protection (Larson 2006).

Animal advocates have referred to the Marin County program as "a model program" that has successfully addressed and embraced ethical concerns, as well as, the differing values of the ranching and animal protection communities (Project Coyote 2015, Fox 2001, Fox et al. 2005). This opinion is not necessarily shared by the Marin County or the greater California livestock community (Larson 2006). Amongst other things, it may be difficult to transfer the program to other regions based on "geographic and demographic differences" (Larson 2006). There are fundamental differences between the types of predators and nature of livestock production in Marin County compared to the State of Idaho. The Marin County program primarily addresses conflicts with coyotes and most livestock is kept in fenced pastures. Marin County does not have prevalent mountain lion or black bear populations or conflicts with these species. Between 1972 and 2013, only four depredation permits were issued for lions in Marin County and none were taken (CDFW 2015). Similarly, between 2006 and 2011, no permits were issued for black bears in Marin County (CDFW 2015). In contrast, WS-Idaho recorded an annual average of 79 work tasks involving conflicts with bears and 262 work tasks involving mountain lions (Table 1-3).[17] The majority of WS-Idaho's PDM assistance requests from sheep producers are from individuals operating large range bands having several hundred or thousands of sheep, with a lesser degree involving sheep producer owning small farm-flocks (<100 sheep). Nonlethal methods effective to reduce conflicts with small to medium predators and livestock in fenced pastures are not always applicable or as effective for situations involving range bands on public lands or conflicts with bear and mountain lions.

Although Marin County's program is touted as a "nonlethal approach" and appears to be less lethal on its face, a study evaluating the effectiveness of the Marin County program (Larson 2006) indicated that more coyotes have been killed during the implementation of the Marin Program, as compared to the WS-California's typical activities. This is due, in part, to the fact that landowners are not prohibited from killing coyotes on their land or hiring others to do so (Larson 2006). Individual producers and others working on their behalf routinely practiced snaring, calling and shooting and denning in an effort to kill damage-causing coyotes (Larson 2006). Larson (2006) also indicated that it is likely that some ranchers are taking more coyotes than when WS was providing assistance. Research conducted in nearby Mendocino County, California indicates that dominant coyote pairs, the most difficult to control by snaring or trapping, cause the majority of lamb losses (Sacks 1999). Experienced employees from WS are likely to be more effective at targeting specific problem coyotes than less experienced members of the public, who are more likely to remove less problematic, but

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[17] A Work Task is defined as a single visit to a property or contact by WS-Idaho personnel: 1) to provide technical assistance; 2) to conduct a wildlife damage field evaluation/assessment/investigation; or, 3) where a PDM activity/project is in progress.

easier to capture or kill, juvenile and subordinate coyotes (Larson 2006). In addition, landowners are rarely trained in expert trapping techniques and are more likely to capture non-target species during their efforts (Larson 2006). Because the Marin County Program has no means of collecting data from landowners on use of lethal methods or take numbers, there is no way to quantify the take of target and non-target populations nor evaluate the environmental impacts of such take. The WS IWDM program uses the MIS program to effectively track the hours, equipment, target and non- target take associated with all operational PDM projects.

A review of Marin County's budget over the first five years of the nonlethal program's implementation found that on average the program cost the county 1.2 times the amount that the WS-California IWDM program cost the county in its highest year (Larson 2006). These budget evaluations only record the county cost for implementation and do not capture the additional landowner costs associated with this program. The inability of the program to pay compensation for all livestock losses and the need to cap loss indemnity payments is also noteworthy.

This EA analyzes an alternative which restricts WS-Idaho involvement in PDM to only using and recommending nonlethal PDM methods (Alternative 3) in detail in Chapter 4. If funding to assist landowners with implementation was provided by cooperating State and county agencies, a program similar to the one in Marin County could be implemented under Alternative 4. Additionally, although Alternatives 1 and 5 allow for use of lethal methods in an integrated PDM strategy, they do not require the use of lethal methods for all projects. WS-Idaho could implement a nonlethal only program if requested by a cooperator under Alternatives 1 and 5. Environmental impacts of the Marin County proposal are likely to be similar to those of Alternative 4.

The Marin County program does not address several of the needs for action identified in Chapter 1. The Marin County program is limited to providing assistance with nonlethal damage management techniques to protect livestock. The program does not help with damage to other types of property or agricultural resources caused by predators or response to risks to human health and safety.

Based on the limitations of the Marin County program noted by Larson (2006) summarized above, the failure of the program to address all needs for action presented in Chapter 1 and the similarity to the nonlethal only alternative (Alternative 3) analyzed in detail, WS-Idaho has determined that detailed analysis of this alternative would not provide substantive new information to aid decision-making and will not be conducted at this time.

3.3.15 Require cooperators to pay 100% of the cost of lethal removal, thereby increasing the availability for federal funds for nonlethal control

This alternative is a modification of Alternatives 1 and 5 in which WS-Idaho would use an integrated PDM approach, including the use of nonlethal and lethal management techniques, to address conflicts with predators in Idaho. Under Alternatives 1 and 5, preference is already given to use and recommendation of nonlethal methods when practical and effective (WS Directive 2.101). Implementation of the proposed modification requiring cooperators to pay 100% of the cost of lethal removal, although appealing to individuals who are opposed to the use of federal funds for lethal PDM, would have unintended adverse consequences in terms of unequal access to federal assistance with PDM. In many instances, cooperators contact WS-Idaho after attempting practical nonlethal methods most likely to be effective for their situation on their own and failing to resolve their damage problem. In a 2011 NASS report, nationwide, livestock producers reported spending an estimated $188.5 million on nonlethal PDM methods in 2010 just to reduce depredation on cattle (NASS 2011)[18]. Under this alternative, these cooperators would have to bear the fiscal burden of lethal PDM even though they had made a good-faith effort to implement appropriate nonlethal methods. However, a producer who had not implemented nonlethal PDM methods or has only engaged in limited use of nonlethal PDM on their own prior to contacting WS-Idaho would qualify for federal assistance with nonlethal PDM methods. Additionally, the availability and efficacy of damage management methods are not equal for all types of damage. For example, more nonlethal methods are available and may be more effective for livestock in fenced pastures than for livestock grazing on open range and fewer nonlethal methods are available to protect range cattle grazing on open range from bear and lion predation than to protect flocks of sheep. Consequently, under this proposal, federal assistance with implementation of PDM would be unequally distributed to individuals experiencing conflicts with predators based on the availability of suitable effective nonlethal methods and not on actual need for assistance or effort in seeking to implement nonlethal PDM on their own. This proposal will not be considered in detail because of the problems associated with unequal access to federal fiscal assistance with PDM.

This proposal is also problematic when considered in context of Executive Order 12898 Federal Actions to Address Environmental Justice. In this case, access to lethal PDM assistance from WS-Idaho would be predicated on the ability of the producer to afford to pay expenses. Low-income producers may not have the funds to pay for lethal PDM assistance from WS-Idaho, particularly if they have already recently paid to implement new nonlethal methods. It is the policy of WS-Idaho to use available public funds for PDM to provide assistance to all producers equally based on need for action, not ability to pay for services.

3.3.16 No WS-Idaho PDM on federal public lands

WS-Idaho's access to lethal methods for PDM on federal public lands is determined by State regulations and the management plans and policies of the respective federal agency. In general, as noted in the discussion of the environmental status quo (Section 2.1), producers leasing grazing allotments, natural resource managers working to protect sensitive species and agency officials responding to threats to human safety associated with predators on federal lands have legal access to the same types of damage management methods as would be used by WS-Idaho. Only three PDM methods are completely or partially restricted to use by WS-Idaho: LPCs, M-44s and DRC-1339. LPCs are not registered for use on open range

[18] Data on expenditures for sheep and goat production and for individual states is not available.

and would not be used on federal lands. The only use of DRC-1339 that could occur on federal lands would be for the reduction of common raven, American crow and black-billed magpie predation on sensitive species or on newborn livestock. In 2014, the ISDA issued a FIFRA Section 24(c) registration (SLN Registration #ID-140005) for Compound DRC-1339 (EPA Reg. No. 56228-29) that allows IDFG personnel to use DRC-1339 to control common ravens, American crows and black-billed magpies that prey on or are suspected of preying on the eggs or the young of federally-designated T/E species (as they have done in 2015 and anticipate doing again in the foreseeable future) or other species designated to be in need of special protection by federal or State wildlife agencies, or to control the target species within 100 feet of utility poles, electrical line towers, communication towers or other man-made structures where their activities cause fire threat, threat to human health and safety, threat to sensitive wildlife species or damage to structures. No M-44s have been used on any National Forest lands within the past 15 years or during the past five years on BLM livestock grazing lands. M-44 use on BLM land has been limited to southeast Idaho, on two livestock grazing allotments and in a very remote area where a history of extensive coyote predation had occurred. WS-Idaho has discontinued all use of M-44s on public lands.

PDM can and is being conducted on federal lands by entities other than WS-Idaho (Sections 1.3.1, 2.1). For example, during 2013, the IDFG contracted with an individual to reduce local wolf populations in the Frank Church River of No Return Wilderness Area to help enhance elk recruitment. Idaho Administrative Code IDAPA 02.01.03 allows private citizens to apply for a permit from the ISDA to engage in airborne control of unprotected or predatory animals to protect land, water, wildlife, livestock, domesticated animals, human life or crops. Permitted persons can conduct aerial shooting activities on BLM and USFS lands. The State law further explains that information about airborne control activities authorized by IDAPA 02.01.03 will be provided to those federal land management agencies on whose land the activities are to be conducted. However, this provision shall not be interpreted to require a permit applicant to obtain permission from the federal land management agency to conduct airborne control activities as a condition of receiving the permit from ISDA (IDAPA 02.01.03.151). Many predator species may be taken by the public or other agencies for PDM in the same manner as actions by WS-Idaho without any requirement to report take to IDFG (Section 1.3.1). Additionally, Title 36, Chapter 11 of Idaho Statutes states that black bear, mountain lion and predators may be disposed of by livestock owners, their employees, agents and animal damage control personnel when the same are molesting or attacking livestock and it is s unnecessary to obtain a permit from IDFG. As discussed for Alternative 2 – No Federal WS-Idaho PDM Program, depending on the training and experience of the individuals conducting the work, selectivity of these actions for target species and target animals (e.g., older territorial adult coyotes that can be more difficult to capture than younger individuals) may be lower than for a program conducted by trained personnel from WS-Idaho (Sacks et al. 1999, Larson 2006). Given that the risks to target and target species on federal lands have the potential to be greater than for the current and proposed alternative, that selection of this alternative would likely reduce public access to information on the PDM conducted on federal lands and that the impacts of this alternative would be intermediate to alternatives already addressed in detail (e.g., Alternative 1 and Alternative 2 or Alternative 5 and Alternative 2), this alternative was not selected for detailed analysis in the EA.

3.4 STANDARD OPERATING PROCEDURES (SOPs) FOR PREDATOR DAMAGE MANAGEMENT METHODS AND TECHNIQUES

WS-Idaho uses protective or minimization measures built into the program in SOPs to prevent or minimize project related negative effects on the environment. For the purposes of this EA, those measures are termed SOPs. The key SOPs are incorporated into all alternatives as applicable, except the no federal program alternative (Alternative 2). Most SOPs are instituted to abate specific issues while some are more general and relate to the overall program.

3.4.1 General SOPs

- WS-Idaho activities are in compliance with applicable guidance established in USFS LRMPs, BLM RMPs, management guidelines for WSAs (BLM 2012), and tribal management plans.
- National MOUs with the BLM and USFS delineate expectations for PDM on public lands administered by these agencies. WS-Idaho AWPs are developed in coordination with BLM, USFS and IDL. AWPs detail activities, target species and SOPs to be implemented on allotments where PDM is needed and requested. This minimizes potential impacts on recreational and cultural resources, public hunting, sensitive species, wildlife viewing and other multiple land uses.
- WS-Idaho would not conduct any work on tribal reservations without prior consent of and consultation with tribal officials to identify and resolve any issues of concern. At the request of federally recognized tribes, WS-Idaho will consult with tribes regarding actions that are not on tribal lands but within ceded territory for the tribe (See also Section 3.4.2.8).
- WS-Idaho's use of traps and snares conform to current rules and regulations administered by IDFG. WS-Idaho employees are exempt from State law that requires a person to visit every trap or snare once every seventy-two (72) hours (IDAPA 13.01.16.200.01.b). However, WS-Idaho typically checks traps and snares at 3-4 day intervals, or sooner.
- Pesticide use complies with EPA rules and regulations administered by ISDA.

3.4.2 SOPs specific to the issues

The following is a summary of SOPs that are specific to the issues listed in Chapter 2 of this document.

3.4.2.1 Effects on target predator species populations

- Depending upon the species and magnitude of the problem, PDM is directed towards localized depredating populations (e.g., coyotes) or individual

offending animals (e.g., black bears and mountain lions) and is never an attempt to eradicate the populations in the entire area or region.
- WS-Idaho personnel use specific trap types, lures and placements that are most conducive for capturing the target animal.

- WS-Idaho monitors all available population information on target and non-target species it kills. Consideration of "Total Harvest" and estimated population numbers of key species are used to assess cumulative effects to maintain the magnitude of harvest below the level that would impact the viability of populations of native species (see Chapter 4). WS-Idaho provides data on total take of target animal numbers to BLM and USFS during annual coordination meetings and to IDFG through annual reports. These reports may also be provided to federally-recognized tribes at the tribe's request. For federally listed species, WS-Idaho notifies IDFG and USFWS of take within 24 hours.
- The WS Decision Model (Slate et al. 1992, WS Directive 2.201), which is designed to identify effective PDM strategies and their impacts, is consistently used.

3.4.2.2 Effects on non-target species populations, including T/E species

- WS-Idaho personnel are highly experienced and trained to select the most appropriate method(s) for taking problem animals with little impact on non-target animals.
- Traps and snares are not set within 30 feet of exposed bait or animal carcasses to prevent the capture of eagles, other raptors and scavenging birds. The only exception to this WS policy is for the capture of mountain lions, black bears and wolves because the weight of these target animals adequately allows foot capture device tension adjustments to exclude the capture of smaller non-target animals.
- Foot snare trigger and foothold trap under pan tension devices are used, as appropriate, by WS-Idaho to reduce the capture of non-target wildlife that weigh less than the target species.
- Breakaway snares (i.e., these are snares that have locks designed to break open and release with 250 to 320 foot pounds of tension, which is what would be exerted by larger non-target animals such as deer, antelope and livestock) have been developed. These snares have been implemented into WS-Idaho activities and are used, as appropriate.
- Non-target animals captured in foothold traps or foot snares are released at the capture site unless it is determined by WS-Idaho personnel that the animal is not likely to survive, whereupon it will humanely euthanized.
- WS-Idaho personnel use specific trap types, lures and placements that are conducive to capturing the target animal, while minimizing potential impact on non-target species.
- WS-Idaho personnel work with the National Wildlife Research Center

(NWRC) and other research programs to continue to improve the selectivity of management devices.

- WS-Idaho has conducted formal and informal consultation with the USFWS Idaho Fish and Wildlife Office in Boise, Idaho. A Biological and Conference Opinion for WS-Idaho wildlife damage management activities in the State of Idaho has been completed by the USFWS and incidental take, reasonable and prudent measures and terms and conditions will be followed by WS-Idaho.

- All foot snares set for black bears, mountain lions and wolves between March 16 and November 30 in areas designated by the USFWS as occupied grizzly bear habitat are checked daily.
- Neck snares set for coyotes and mountain lions, as well as neck snares set for wolves and beavers, placed in habitats occupied by grizzly bears or Canada lynx within Idaho will be restricted to placement between December 1 and March 15 and, within the Southern Mountain Caribou Recovery Zone, to areas below 4,500 feet in elevation.
- Foothold traps set for mountain lions and wolves between March 16 and November 30 in grizzly bear habitat are checked daily and having jaw width of greater than eight inches, are anchored sufficiently to hold an adult grizzly bear so they may be released.
- When using culvert and large cage traps to capture black bears, coyotes, feral and free-ranging dogs, red fox and mountain lions in areas occupied by Canada lynx, WS-Idaho will not use any olfactory attractants containing fish oil, catnip, anise or castor a to reduce the likelihood of attracting lynx and other feline species.
- When using foothold traps to capture wolves, coyotes and mountain lions and foot snares to capture black bears, grizzly bears, mountain lions and wolves in areas occupied by Canada lynx, WS-Idaho will not use visual or olfactory attractants that may be expected to attract lynx and will use a pan-tension device adjusted such that it would require 8-10 pounds of pressure to trigger the trap or snare.
- In areas where wolverines may occur, foothold traps set by WS-Idaho for capturing wolves, coyotes and mountain lions and foot snares set for black bears, grizzly bears or mountain lions, will be placed away from animal carcasses and not use musky or castor-based olfactory lures, unless the use of these lures are absolutely necessary. Additionally, a detailed site assessment will be performed by WS-Idaho personnel to ensure no fresh wolverine sign is present. If sign indicates wolverine are actively using the project area, foothold traps will not be used.
- Neck snares set in the Payette National Forest by WS-Idaho for capturing black bears, wolves, coyotes, bobcats and mountain lions will be placed away from animal carcasses, will not use musky or castor-based lures and WS-Idaho will perform a detailed site assessment to ensure no fresh wolverine sign is present.

- If the consultation with the USFWS on wolverine to supplement the recently completed Biological Opinion determines there are additional SOPs for WS-Idaho to implement to minimize potential impacts to wolverines, WS-Idaho will comply with those new SOPs, including any annual reporting of incidental take, as may be established.
- WS-Idaho will submit an annual report to the USFWS-Idaho Fish and Wildlife Office with a 20-year running total of incidental grizzly bear captures and 40-year running total for Canada lynx captures.
- WS-Idaho will contact cooperating agencies to determine bald and golden eagle nest and winter roost locations in areas where PDM activities are proposed during annual work plan meetings. Annual meetings will also address other sensitive species for which the IDFG, BLM, USFWS and tribes are concerned.
- If bald or golden eagles are encountered during aerial shooting operations, the aircraft will leave the immediate vicinity as soon as possible.
- Non-target raptors live-captured in foothold traps and snares that are deemed likely to survive if released will be transferred to a rehabilitator for medical check and treatment (if needed) prior to release. WS-Idaho personnel will not euthanize any live captured eagles without first consulting with the USFWS.
- If wintering big game or wild horses are encountered during aerial shooting operations, the aircraft will leave the area.
- Only coyotes, wolves and red foxes would ordinarily be taken by WS-Idaho aerial shooting operations.
- M-44s will not be set in areas where ESA-listed Threatened, Endangered, Proposed, Candidate, or Experimental species populations might be adversely affected. DRC-1339 is not applied in areas where the product may be consumed by animals that are from ESA-listed Threatened, Endangered, Proposed, Candidate and Experimental species populations.
- Black bear and mountain lion damage management would be restricted to offending individuals, unless otherwise directed by the IDFG.
- When practical, WS-Idaho will work with IDFG to facilitate removal of depredating black bears and mountain lions by licensed sport hunters during the legal sport hunting season.
- The use of nonlethal methods, such as guard dogs and animals, scare devices and other methods, which may become available, would be encouraged when appropriate.
- WS-Idaho will work with IDFG and the land management agency to minimize disturbance to sage-grouse and Columbian sharp-tailed grouse leks during the spring lekking season.
- WS will comply with the same policies and procedures for reducing risk of invasive plant seed transmission implemented and required of land management agency personnel.

3.4.2.3 Impacts on Special Management Areas (SMAs)

- PDM would follow guidelines as specified in Idaho AWPs.
- Vehicle access would be limited only to existing roads existing roads, unless off-road travel is specifically allowed by the land management agency and conforms to the LRMPs and RMPs.
- PDM would not be conducted without prior (at least annual) consultation with the land management agency.
- WS-Idaho personnel collaborate with the public land management agencies to develop AWPs which identify areas or circumstances (e.g., a special use permit for a specific gathering or event on public lands) during which the use of certain methods will not be used in order to minimize conflicts with other uses of the site. If it were necessary to work in areas outside the planned area, the area manager or their representative would be contacted in a timely manner to discuss and resolve the situation.
- WS-Idaho may also develop systems for consultation and coordination with tribes at the request of the tribe.
- PDM would be conducted only when and where a need exists and a request is received.
- No aerial shooting will be conducted in any wilderness area unless specifically authorized by the applicable USFS Regional Office or BLM State Office.
- No toxicants would be used in any wilderness or other SMA.
- No proactive (preventive) control would be conducted in any Wilderness Area.
- PDM in Wilderness Areas would be conducted in accordance with each land management agency's Wilderness Policies and guidance documents and MOUs and the provisions identified in AWPs (e.g., BLM Manual 6330).

3.4.2.4 Humaneness and ethical perspectives

- Chemical immobilization and euthanasia procedures that do not cause pain or undue stress are used by certified personnel when practical.
- Research would continue to improve the selectivity and humaneness of PDM methods and tools.
- WS will incorporate new practical and effective nonlethal methods as they become available after applicable review under the NEPA.
- Breakaway snares have been developed and implemented into WS-Idaho PDM activities. Breakaway snares are designed to break open and release with tension exerted by larger non-target animals, such as deer, elk and livestock.
- WS-Idaho personnel attempt to kill captured target animals that are slated for lethal removal as quickly and humanely as possible. In most field situations, a shot to the brain with a small caliber firearm is performed which causes rapid unconsciousness followed by cessation of heart function and respiration. A well

placed shot to the head is in concert with the American Veterinary Medical Association's definition of euthanasia. In some situations, accepted chemical immobilization and euthanasia methods are used.

- Foothold traps and snares would be checked at intervals consistent with State of Idaho regulations.
- Pan-tension devices would be used to reduce the incidence of non-target animal capture in foothold traps and leg snares, unless such devices would preclude capturing target animals.
- WS personnel shall adhere to the WS Code of Ethics (Directive 1.301) which stipulates that WS personnel:
  a. Will affirm their strict adherence to the laws, regulations, policies, and Executive Orders that guide the WS program.
  b. Will conduct themselves in a manner that embodies the traits of honesty, integrity, accountability, dedication and a strong work ethic.
  c. Will promote competence in the field of wildlife damage management through continual learning and professional development.
  d. Will show exceptionally high levels of respect for people, property and wildlife.
  e. Will promote the conservation of natural resources.
  f. Will respect varying viewpoints regarding wildlife and wildlife damage management.
  g. Will utilize the WS Decision Model to resolve wildlife damage problems and strive to use the most selective and humane methods available, with preference given to nonlethal methods when practical and effective.
  h. Will provide expertise on managing wildlife damage to the public at their request.
  i. Will present an image worthy of the WS program and the wildlife management profession.
  j. Will work in a safe and responsible manner.
  k. Will respect and adhere to program civil rights and equal employment goals and opportunities and will promote a diverse workplace that does not tolerate discrimination.
  l. Will support the mission of the WS program.

3.4.2.5 Cultural Impacts Including Impacts on Native American Cultural Uses, Hunting, Non-Consumptive Uses, and Aesthetic Impacts

- WS-Idaho personnel develop AWPs in cooperation with BLM, USFWS and IDL annually to discuss potential PDM activities and exchange information necessary to reduce conflict with other multiple uses on said lands. These plans include delineation of areas where certain methods may not be used during certain time periods when conflicts with recreation, wildlife viewing, hunting and other planned multiple use events may occur.
- WS-Idaho will establish a system of regular consultation and communication with the Nez Perce tribe to inform the tribe of WS-Idaho activities and to

collaborate on mechanisms to minimize potential risks of adverse impacts on cultural sites, hunting and gathering by tribal members and other cultural values and activities of tribal members within the ceded territory.

- At the tribe's request, WS-Idaho will provide reports of PDM activities in counties that include lands within tribal boundaries or which are within tribal ceded territories.
- At the tribe's request, WS will consult with the tribe prior to initiating any new projects for protection of natural resources in ceded territories.
- PDM activities will be conducted in accordance with and for the areas specified in BLM RMPs and USFS LRMPs.
- No M-44 devices would be used on any public lands.
- WS-Idaho has consulted with the Idaho State Historic Preservation Office on July 30, 2014 and it was determined that PDM is not likely to affect historic properties or archeological sites (SHPO 2014). Predator Damage Management does not cause any major ground disturbance and is not normally considered an undertaking that would trigger the need to consult with the State Historic Preservation Office under Section 106 of the National Historic Preservation Act.

3.4.2.6 Impacts on public and pet safety and the environment

- All pesticides used by WS-Idaho are registered with the EPA and ISDA. WS-Idaho employees will comply with each pesticide's directions and labeling, along with EPA and ISDA rules and regulations. Pesticides are stored in compliance with EPA and ISDA pesticide label requirements and in closed containers at WS worksites. Storage sites are inspected annually by supervisors or managers.
- Pesticide use complies with EPA and ISDA rules and regulations administered by ISDA.
- EPA-approved label directions are followed by WS-Idaho employees.
- WS-Idaho inventory all pesticides and hazardous materials monthly and report such inventory to the State Office.
- Unattended pesticides are locked at all times to prevent theft or unauthorized use.
- The WS Decision Model is designed to identify the most appropriate PDM strategies and their impacts.
- WS-Idaho employees that use pesticides are trained to use each specific material and are certified to use pesticides under EPA approved certification programs.
- WS-Idaho employees who apply pesticides in Indian Country are certified by the EPA or applicable tribe.
- M-44s are used by WS-Idaho personnel who are trained and have State certification from ISDA to use sodium cyanide and the M-44 device within label restrictions. PDM activities that involve the use of sodium cyanide and the M-44 device are conducted in accordance with both State and federal EPA regulations and label restrictions.
- The LPC is registered by the EPA and ISDA and WS-Idaho personnel who apply this pesticide are provided training in use, recordkeeping, personal

protective equipment, proper waste disposal, antidote and storage. Annual reporting for LPCs to ISDA is required by IDAPA 02.03.03.101.02.

- All LPCs not in use are kept under lock and key at all times.
- WS-Idaho employees who use pesticides participate in continuing education programs to keep abreast of developments and to maintain their certification.
- Foothold traps and snares would be placed so that captured animals would not be readily visible from any designated recreational road or trail shown on USFS Forest Transportation Maps or from federal, State or county roads.
- Bilingual (English and Spanish) warning signs are posted on main roads and/or trails leading into any areas where foothold traps, snares or M-44s are being used. These signs would be removed at the end of the control project.
- In addition to area warning signs, individual warning signs would be placed within 25 feet of each M-44 device.
- No M-44 devices would be used by WS-Idaho on public lands (e.g., National Park Service (NPS), BLM, IDL, USFS and IDFG).
- No foothold traps, snares or M-44s would be allowed within ½ mile of any residence, community or developed recreational site, unless requested by the owner of a privately-owned property or an official from the appropriate land management agency.
- WS-Idaho consultations with tribes and land management agencies will include information on areas which are heavily used by recreationists (e.g., commonly used trails) and tribal members exercising treaty rights and times of year when use is particularly heavy so that PDM activities in these areas may be planned to minimize safety risks.
- Public safety zones are delineated and defined in AWPs by BLM and USFS during annual AWP reviews. The public safety zone is ¼ mile, or other appropriate distance, around any residence or community, county, State or federal highway or developed recreation site.
- PDM conducted on federal lands within the identified public safety zones will generally be limited to activity aimed at the protection of human health and safety. However, land management agencies could request PDM activities in the public safety zone for an identified need.
- WS-Idaho personnel who use immobilization and euthanasia controlled substances are required to obtain a 16-hour training course and take a Distance Learning Module training course. Refresher training is required every three years. They must also apply for and receive a registration from the U.S. Drug Enforcement Administration and license from the Idaho Department of Pharmacy before purchasing and administering such drugs. Registration and licensing are annual requirements.
- All aerial shooting operations and safety activities, including training and maintenance, are conducted in strict compliance with the Federal Aviation Regulations, Fish and Wildlife Act of 1956, applicable State and local laws and

regulations, WS's Aviation Operations and Safety Manual and WS-Idaho's Aviation Emergency Response Plan and Operating Procedures.

3.4.2.7 Cost effectiveness

- The costs and likely effectiveness of different PDM methods and actions will be considered in context of site-specific factors (e.g., size of operation, feasibility) to assist WS-Idaho's planning and decision making for each request for PDM assistance. Consideration will be given to different values such as selectivity and humaneness, impact on tribal members exercising treaty rights, values of wildlife to non-consumptive users, and ecological services provided by target and non-target species.

3.4.2.8 Consultation and coordination with tribes

- WS-Idaho will establish a mechanism of regular consultation and coordination (no less than annually) with the Nez Perce Tribe to address tribal concerns regarding potential impacts of WS-Idaho activities on cultural resources, treaty rights, and other issues of importance to the tribe relative to PDM. Similar consultations may be established with other federally-recognized tribes at the tribe's request.
- WS-Idaho will provide annual reports of WS-Idaho activities to the Nez Perce Tribe for counties included in the Nez Perce ceded territories and copies of annual reports provided to IDFG and USFWS. Similar reports may be provided to other federally-recognized tribes at the tribe's request.

3.4.2.9 Indirect and cumulative impacts

- WS-Idaho personnel consult with BLM, USFWS, USFS, IDFG, tribes and other appropriate agencies regarding program impacts. Frequent contacts are made with BLM and USFS when conducting PDM on public lands administered by these agencies.
- WS-Idaho regularly coordinates with IDFG, USFWS and affected tribes concerning the wildlife species being targeted and numbers taken.
- PDM activities are directed at taking action against individual problem animals or local populations to resolve depredation problems.
- WS-Idaho take of predators is monitored. Total animal take is considered in relation to the estimated population numbers of key species. These data are used to assess cumulative effects so as to maintain the magnitude of harvest below the level that could impact the viability of a population.

CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

Chapter 4 provides the information needed to make informed decisions when selecting the appropriate alternative to meet the need for action presented in Chapter 1. This Chapter analyzes the environmental consequences of each alternative in relation to the issues identified for detailed analysis in Chapter 2.

4.1 ENVIRONMENTAL IMPACTS ANALYZED

The environmental consequences of each alternative are compared with the environmental baseline (no action alternative/Alternative 1) to determine if the real or potential impacts are greater, lesser or the same. Cumulative and unavoidable impacts, and direct and indirect effects are discussed in relation to the issues for each of the alternatives and the potentially affected species in this Chapter, as appropriate.

- *Direct effects* are caused by the proposed action and occur at the same time and place.
- *Indirect effects* are caused by the proposed action and are later in time or further removed in distance, but are still reasonably foreseeable. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate and related effects on air and water and other natural systems, including ecosystems.

WS-Idaho PDM activities have been evaluated for their impacts on several natural environmental factors. However, there are some natural resources that are not discussed in this EA because the impacts on them are considered negligible.

4.1.1 Non-significant Impacts

The actions discussed in this EA do not involve major ground disturbance, construction or habitat alteration. They would not cause changes in the flow, quantity or storage of water resources. All chemicals used for PDM are used, stored and disposed of in accordance with EPA and State requirements for the protection of the environment. Consequently, the following resources within Idaho are not expected to be significantly impacted by any of the alternatives analyzed: soils; geology; minerals; water quality and quantity; floodplains; wetlands; other aquatic resources; visual resources; air quality; prime and unique farmlands; timber; and range. These resources will not be analyzed further.

4.1.2 Irreversible and Irretrievable Commitments of Resources

No irreversible or irretrievable commitments of resources are expected, other than the minor use of fuels for motor vehicles and other equipment and similar materials. These will not be discussed further.

4.1.3 Other Environmental Resources

All WS-Idaho actions 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 13514. WS-Idaho activities are evaluated for their impact on the human environment and compliance with Executive Order 12898 to ensure Environmental Justice. WS-Idaho personnel use wildlife damage management methods as selectively and environmentally conscientiously as possible. All chemicals used by WS-Idaho are regulated by the EPA through FIFRA, ISDA, by MOUs with federal land management agencies and by WS Directives. The WS-Idaho operational program properly disposes of any excess solid or hazardous waste. It is not anticipated that the proposed action would result in any adverse or disproportionate environmental impacts to minority and low-income persons or populations. Similarly, because WS makes it a high priority to identify and assess environmental health and safety risks, WS-Idaho has considered the impacts that alternatives analyzed in this EA might have on children as per Executive Order 13045. All WS-Idaho PDM is conducted using only legally available and approved damage management methods where it is highly unlikely that children would be adversely affected.

Activities described under the proposed action do not cause major ground disturbance and are not undertakings as defined by the NHPA. In 2014, WS-Idaho consulted with the State Historic Preservation Office and received that office's concurrence that the PDM activities proposed in this EA would be unlikely to have any adverse effects on cultural, archeological or historic resources. In most cases, PDM has little potential to cause adverse effects to sensitive cultural resources because construction and earth moving activities are not conducted. WS-Idaho has also reached out to Native American tribes in the State and offered to consult regarding potential impacts of PDM activities, and is establishing systems of regular consultation with tribes when requested.

4.2 ISSUES ANALYZED IN DETAIL

The environmental consequences of the five alternatives are discussed below with emphasis on the issues described in Chapter 2. Those issues are:

- Effects on Target Predator Species Populations
- Effects on Non-target Species Populations, Including T/E Species
- Impacts on Special Management Areas (SMAs) (e.g., designated wilderness areas)
- Humaneness and Ethical Perspectives
- Cultural Impacts including impacts on Native American Cultural Uses, Hunting, Non-Consumptive Uses, and Aesthetic Impacts
- Impacts on Public and Pet Safety and the Environment
- Cost Effectiveness
- Indirect and Cumulative Impacts

Scale of Analysis Area

The scope of analysis for the proposed PDM activities is limited to the State of Idaho because this is scale at which the majority of the regulatory, funding and wildlife management activities involving species addressed in this EA occur. Specifically, IDFG is the primary management authority for almost all wildlife species addressed in this EA except species federally-listed under the ESA, MBTA and Bald and Golden Eagle Protection Act. State-level management of resident wildlife is the norm across the country and is sufficient for most species with relatively limited movements, and we have chosen a similar scale for the impact analysis. However, for some species, the analysis of environmental impacts in this section may be conducted at a larger scale. For example, impacts on highly mobile species, such as migratory birds, are also considered at the regional scale. Similarly, impact on T/E species (e.g., grizzly bears) are discussed in context of overall USFWS management plans for the recovery of the species. Although the specific location where PDM occurs cannot be consistently predicted (Section 1.6.1), local consequences of management actions are also addressed where applicable.

Significance Criteria

The CEQ regulations on implementation of the NEPA (40 CFR 1500-1508) describe the elements that determine whether or not an impact is "significant." Significance is dependent upon the context and intensity of the impact. The following factors will be used to evaluate the significance of impacts in this EA as they relate to the context and intensity of biological and other ecological effects. Social and economic impacts will be evaluated similarly to the extent applicable.

- **Magnitude of the Impact.** Magnitude relates to the size, number or relative amount of the impact. It is a measure of intensity. Magnitude as it relates to biological impacts is a measure of the number of individual animals or species removed in relation to their abundance. Magnitude may be determined either quantitatively or qualitatively. Quantitative analyses are preferred when possible, however, some issues do not lend themselves to quantitative analysis (e.g., some sociological issues) or quantitative data may not be available. In these instances, qualitative analyses incorporating information such as population trends, modeling and available studies and other publications (e.g., for review of most sociological issues) may be used.
- **Duration and Frequency of the Impact.** The duration and frequency may be temporary, seasonal, or year round. Duration and frequency of impact is a measure of intensity.
- **Likelihood of the Impact.** The likelihood of an impact is a measure of its intensity by estimating the possibility that an activity or impact may occur. May include factors such as the recurring need for PDM at a given location.
- **Geographic Extent**. The consideration of the geographic extent of an effect may be site specific, within a given management area, at the State/territory/tribal land area, regional and/or national land area. Geographic extent may also consider the range and movement patterns of animal species. The geographic extent of an effect is a contextual consideration.
- **Legal Status.** The legal status of an affected resource is a contextual consideration. Legal status may range from fully protected by federal law, such as an endangered species, to non-

protected by law, as is the case for coyotes, fox, skunks and raccoons in Idaho.

- **Conformance with Statutes, Regulations and Policies.** Statues, regulations and policies provide contextual information in the analysis. Compliance with applicable statutes, regulations and policies can also serve as mitigation to ensure that certain types of adverse impacts on the environment do not occur.

4.2.1 Alternative 1: Continue the Current Federal WS-Idaho PDM Program

Under this alternative, WS-Idaho would use and recommend a combination of nonlethal and lethal damage management techniques to address wildlife damage in the State. There is generally little risk of injury or death to target species associated with the use of nonlethal methods and most impacts to target species are associated with the use of lethal PDM methods (Appendix C). However, even with some nonlethal methods there can be some risk of unintentional injury or mortality from factors such as aggressive behavior by livestock guarding animals, live-capture devices or immobilizing drugs. Overall risk is likely to be less than one animal per species per year with no mortality or substantial injuries expected in most years.

4.2.1.1 Alternative 1. Effects and Impacts on Target Predator Species Populations

The primary target species taken yearly by WS-Idaho for PDM are coyote (*n*=3,081), raven (*n*=142) and black-billed magpie (*n*=83) (Tables 4.1a). Most other target predators are taken by WS-Idaho only on an occasional basis. Yearly averages of all target species killed during FY 2011 to FY 2014 by WS-Idaho on all land classes are presented in Table 4.1a. Reviewing the four-year average take, coyotes represented 89.7% of the total of animals killed, with ravens at 4.1%, black-billed magpies 2.4% and all other species combined (*n*=10 species) at 3.8%. The number of predators taken during PDM activities varies from year to year as a result of many different factors including; environmental factors that may impact the extent to which animals are attracted to human-related food sources (e.g., cyclic jackrabbit population declines, drought), the number of requests for assistance, new or resolved issues or concerns for that species, and/or the capacity to conduct PDM activities with available funding. In general, when predator populations increase, the occurrence of damage caused by the predators increases, which in turn results in increased PDM activities and, thus, the take. Likewise, when predator populations decrease, the occurrence of damage caused by the predators tends to decrease, which results in less PDM activities and less take. Because of this close coordination of "response to event," take, as a percent of the population, tends to be relatively consistent with increases and decreases in target species population levels. Population trend information for the species listed in Table 4.1a is provided in Table 4.1b.

Table 4.1a. Animals targeted and killed by method of take by WS-Idaho while conducting all PDM activities during FY 2011-2014 (MIS 2011, 2012, 2013, 2014). Includes also black-billed magpies, crows and ravens targeted and killed during other bird damage management activities previously addressed in USDA (2006). Includes totals by FY and subtotals by method.

Species / Method	**FY11**	**FY12**	**FY13**	**FY14**
American Crow	**0**	**50**	**0**	**0**
drc-1339-id sln (feedlot)		50		
Badger	**10**	**29**	**18**	**8**
firearms	1	1	3	
snares, neck	1	3	1	
traps, foothold	4	25	13	8
traps, foothold (padded)	**4**		**1**	
Black-billed Magpie	**60**	**83**	**92**	**95**
drc-1339-id sln (feedlot)	60	43	92	
drc-1339-livestock/nest/fodder		40		95
Black Bear	**4**	**4**	**3**	**7**
firearms	1	1		2
fixed wing		1		
snares, foot/leg	3	1	3	1
snares, neck				
traps, foothold		1		4
Bobcat	**0**	**6**	**0**	**1**
firearms		2		1
snares, neck		3		
traps, foothold		1		
Raven**, Common**	**91**	**190**	**206**	**79**
drc-1339-id sln (feedlot)	59	25	26	20
drc-1339-livestock/nest/fodder	31	160	180	45
drc-1339 meat				6
firearms	1	5		8
traps, body grip				
Coyote	**4156**	**3120**	**2772**	**2273**
firearms	499	282	300	239
fixed wing	3059	2040	1854	1434
handcaught/gathered			1	
helicopter	150	149	33	92
m-44 cyanide capsule	87	99	114	105
snares, neck	118	260	214	168
traps, foothold	233	283	226	220
traps, foothold (padded)	10	7	30	15
Feral Cat	**0**	**3**	**1**	**0**
traps, cage		1	1	
traps, foothold		2		
Feral and free-ranging dog	19	8	8	1

firearms	10	3	4	
m-44 cyanide capsule			2	
snares, neck	1		2	1
traps, foothold	8	5		
Grizzly Bear	**0**	**1**	**0**	**0**
snares, foot/leg		1		
Mountain Lion	**2**	**4**	**7**	**1**
firearms	1	2		
snares, neck			2	
traps, foothold	1	2	5	1
Raccoon	**34**	**30**	**12**	**10**
firearms	1			
handcaught/gathered	5			
snares, neck	3	4	2	
traps, body grip		1		
traps, cage	19	23	5	9
traps, foothold	6	2	5	1
Red Fox	**35**	**32**	**34**	**8**
firearms	4	2	3	1
m-44 cyanide capsule	1	2		
snares, neck	12	7	7	3
traps, cage	4			
traps, foothold	13	21	23	3
traps, foothold (padded)	1		1	1
Striped Skunk	**60**	**24**	**25**	**17**
firearms	3	1		1
snares, neck	4	8		
traps, body grip	4			
traps, cage	43	13	10	13
traps, foothold	6	1	15	3
traps, other		1		

[1] Totals may not add up to 100% due to rounding.

This Chapter measures the number of individuals lethally removed in relation to that species abundance to determine the magnitude of impact to the populations of those species 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 are quantitative, whereas, determinations based on population trends and harvest trend data, when available, are qualitative. Table 4.2 provides an overview of the estimated population and known mortality caused by non-WS activities for those species that were involved with WS-Idaho PDM activities from FY 2011 through FY 2014. More detailed information for each species is provided in the population, impacts and cumulative impacts analysis Sections below.

Table 4.1b. Statewide population status of the species that may be targeted and killed by WS-Idaho while conducting all PDM activities.

SPECIES	Statewide Population Status	Source
American Crow	Stable - Increasing	BBS 2016
Badger	Stable - Increasing	IDFG 2014*b*
Black-billed Magpie	Increasing	BBS 2016
Black Bear	Variable by Management Unit	IDFG 2012b
Bobcat	Stable	IDFG 2014*b*
Raven	Stable - Increasing	BBS 2016
Coyote	Stable - Increasing	IDFG 2014*b*
Feral Cat	NA	
Feral and free-ranging dog	NA	
Grizzly Bear	Stable - Increasing	USFWS 2014
Mountain Lion	Stabilizing	IDFG 2013c
Raccoon	Stable - Increasing	IDFG 2014*b*
Red Fox	Stable - Slight Decrease	IDFG 2014*b*
Striped Skunk	Stable - Increasing	IDFG 2014*b*

For each of the target species analyzed below, we provide an estimate of the maximum annual take that could occur (Table 4.1a). This estimate provides a limit on the number of animals that could be taken by WS-Idaho and helps to facilitate impact analysis. A number of factors can influence the rate of conflicts with predators, and there can be considerable variation in the amount of requests for PDM involving any given species from year to year within that limit. The estimates of maximum annual lethal removal by WS-Idaho, takes this variation into consideration. In most cases, annual take will be less than the maximum set for the alternative. Under no circumstances should the maximum level of take be interpreted as the target number of animals WS-Idaho seeks to remove. WS-Idaho has no intent to take the maximum number of animals listed for each species simply for the sake of removing animals. WS gives preference to nonlethal methods where practical and effective (WS Directive 2.101). The WS program works to resolve conflicts with wildlife while minimizing risk of adverse impacts on a case by case basis. Through the use of the WS Decision Model, if the determination is made that lethal methods are necessary, efforts focus on removing specific depredating individuals or reducing local populations. PDM activities are not conducted with the intent to cause large scale population reductions.

Estimating wildlife populations over large areas can be extremely difficult, labor intensive, and expensive (e.g., Gese and Terletzky 2009). Wildlife management agencies, like the IDFG and USFWS, have limited resources to conduct wildlife population surveys and monitor population trends. Available resources are allocated to species of greatest conservation need, popular game species with limited populations, and/or where available information indicates a harvested species may be particularly vulnerable to over-harvest. States may also monitor population health using factors such as sex ratios and age distribution of the population. Indices of abundance, such as the BBS or data on catch-per-unit effort from hunter surveys, also serves as measures of population health and the cumulative impact of all environmental factors on the population. This type of information gathering by these agencies represent the best available data from which they establish their own management goal for the species under their jurisdiction. This EA uses the best available information to assess wildlife population size and status. When determining impacts of program activities, as noted above, we use maximum estimates of potential take, but conservative estimates of population size. In this way, the population impact assessments listed below adjust for imperfect data by erring in favor of over-estimating potential impacts on wildlife populations.

Table 4.2. Overview of the statewide estimated population and known mortality caused by non-WS-Idaho PDM activities involving species targeted by WS-Idaho for PDM during CY 2011 to CY 2014.

Species	Idaho Estimated Population	Known Mortality other than WS-Idaho[1]				4-year average
		2011	2012	2013	2014	
American Crow	120,000[1a]	1[2]	50[2]	36[2]	0[2a]	21.75
Badger	83,557[3]	523[3a]	286[4, 4a]	237[5, 4a]	271[6]	330
Black-billed Magpie	300,000[1b]	25[2]	83[2]	400[2, 2a]	26[2b]	127.75
Black Bear	20,000[6a]	2,525[6b]	2,263[7]	2,402[8]	2,190[9]	2,345
Bobcat	8,356	953[3a, 4a]	1,135[4, 4a]	1,076[5, 4a]	1,060[6, 4a]	1,056
Raven	50,000[1b]	110[10, 4a]	19[10]	10[10]	13[10a, 4a]	38
Coyote	50,134[3]	2,577[10b]	3,728[10b]	3,466[10b]	4,098[6, 4a]	3,522
Feral Cat	11	72[12]	112[12]	131[12]	150[12]	116
Feral and free-ranging dog	11	20[12a]	27[12a]	29[12a]	25[12a]	25
Grizzly Bear	806[13]	47[13a]	58[14]	32[15]	NA[2a]	46
Mountain Lion	2,000-3,000[15a]	492[15b]	531[16]	553[17]	564[18]	535
Raccoon	41,778[3]	1487[3a, 4a]	1,449[4, 4a]	1,522[5, 4a]	2,080[6, 4a]	1,634
Red Fox	25,067[3]	992[3a, 4a]	1,206[4, 4a]	1,284[5, 4a]	1,394[6, 4a]	1,219
Striped Skunk	41,778[3]	781[3a, 4a]	841[4, 4a]	739[5, 4a]	827[6, 4a]	797

[1] Does not include mortality from wildlife damage management activities conducted by WS-Idaho.

[1a] Estimated populations for Idaho only by Partners in Flight Science Committee (2015), based on Rich et al.

(2004) and PIF and RMBO (2004).

[2] Data from the USFWS Depredation orders for migratory birds (M. Lawrence, USFWS Region 1, pers. comm. 2015). The IDFG does not collect hunter harvest data on crows.
[2a] 400 crows reported to USFWS and 1 crow reported to IDFG as road killed.
[2b] Reported to IDFG as road killed.
[3] Based on calculations in Chapter 4.
[3a] IDFG (2011*a*).
[4] IDFG (2012*a*). Animals harvested from July 1, 2011 to June 30, 2012.
[4a] IDFG (2015*b*).
[5] IDFG (2014*b*). Animals harvested from July 1, 2012 to June 30, 2013.
[6] S. Nadeau, IDFG, pers. comm., 2015.
[6a] J. Rachael, IDFG, pers. comm., 2015. Black bear data from 2010.
[6b] IDFG (2011*b*, 2015*b*) and J. Rachael, IDFG, pers. comm., 2015.
[7] IDFG (2012*b*, 2015*b*) and J. Rachael, IDFG, pers. comm., 2015. Bears harvested from July 1, 2011 to June 30, 2012.
[8] J. Rachael, IDFG, pers. comm., 2015 and IDFG (2015).
[9] S. Nadeau, IDFG, pers. comm., 2015, J. Rachael, IDFG, pers. comm., 2015, and IDFG (2015*b*).
[10] Killed from USFWS Depredation Permits (M. Lawrence, USFWS, pers. comm., 2015.)
[10a] A. Moser, IDFG, pers. comm., 2015.

[10b] Includes coyotes taken by private hunters and trappers (IDFG 2012*a*, 2014*b*) and (S. Nadeau, IDFG, pers. comm. 2015), coyotes taken from private aerial shooting (ISADCB 2011*b*, 2012, 2013), and coyotes reported to IDFG as roadkills (IDFG 2015*b*).
[11] No population estimate available.

[12] IDFG (2015*b*). These animals were reported as “domestic cats” because in most cases pet cats are difficult to differentiate from feral cats unless they are wearing some type of ownership identification, however, most likely, the majority of these reported animals are feral cats. State fiscal years – July 1, to June 30, of each year.

[12a] IDFG (2015*b*). These animals were reported as “domestic dogs” because in most cases pet dogs are difficult to differentiate from feral and free-ranging dogs unless they are wearing some type of ownership identification, however, most likely, the majority of these reported animals are feral and free-ranging dogs. State fiscal years – July 1, to June 30, of each year.

[13] Estimated grizzly bear populations in the GYE, Selkirk, and Cabinet-Yaak. There are no reliable estimates for Idaho only portion of these defined ecosystems due to the transient nature of grizzly bears. A 3-year average is provided for 2011, 2012, and 2013 in the last column because data for 2014 is incomplete and providing a 4-year average would skew the data.
[13a] Cain (2012). Based on estimates provided by USFWS (2011*b*) for the Cabinet-Yaak and Selkirk Ecosystems. Human-caused mortality between 1980 and 2008 for the Cabinet-Yaak is 1.3 grizzly bears per year, and Selkirk is 1.6 grizzly bears per year.
[14] Cain (2013). Based on estimates provided by USFWS (2011*b*) for the Cabinet-Yaak and Selkirk Ecosystems. Human-caused mortality between 1980 and 2008 for the Cabinet-Yaak is 1.3 grizzly bears per year, and Selkirk is 1.6 grizzly bears per year.

[15] Cain (2014). Based on estimates provided by USFWS (2011*b*) for the Cabinet-Yaak and Selkirk Ecosystems. Human-caused mortality between 1980 and 2008 for the Cabinet-Yaak is 1.3 grizzly bears per year, and Selkirk is 1.6 grizzly bears per year.

[15a] Nadeau (2008).

[15b] IDFG (2011*c*, 2015*b*) and J. Rachael, IDFG, pers. comm. 2015 (Reported mountain lion mortality from illegal kill, incidental trapping mortality, wounding loss, natural mortality, unknown causes, and other. Data provided by calendar year.). Includes male and females harvested from July 1, 2010 to June 30, 2011.

[16]IDFG (2012*c*, 2015*b*) and J. Rachael, IDFG, pers. comm. 2015 (Reported mountain lion mortality from illegal kill, incidental trapping mortality, wounding loss, natural mortality, unknown causes, and other. Data provided by calendar year. Includes male and females harvested from July 1, 2011 to June 30, 2012.

[17] IDFG (2013*c*, 2015*b*) and J. Rachael, IDFG, pers. comm. 2015 (Reported mountain lion mortality from illegal kill, incidental trapping mortality, wounding loss, natural mortality, unknown causes, and other. Data provided by calendar year. Includes male and females harvested from July 1, 2012 to June 30, 2013.
[18] J. Rachael, IDFG, pers. comm., 2015.

Coyote Population Information

Coyotes are found throughout the continental United States. They flourish throughout the entire State of Idaho including urban areas. The ability to adapt to changing environmental conditions and its opportunistic nature has allowed the coyote to continually increase its numbers and expand its range. Habitat changes that have occurred over the last two hundred years as a result of human development often favor this species.

Throughout much of Idaho, coyotes consume rabbits, rodents, birds and carrion. Deer and antelope fawns are occasionally prey in some areas, while in others the coyote diet may include insects and plant materials. Coyotes in urban areas forage at landfills, eat from garbage cans and may feed on domestic dogs, cats and other pets, and in some areas, coyotes prey on domestic sheep, cattle and poultry.

Coyotes are classified by the IDFG as a predatory animal in Idaho and may be taken year-round for any reason. Most coyote damage management is limited to removal of chronic problem animals. In areas where coyotes prey on domestic livestock, animals are removed to prevent further losses.

Many authors have estimated coyote populations throughout the west and elsewhere (Pyrah 1984, Camenzind 1978, Knowlton 1972, Clark 1972, USFWS 1979, Hurley et al. 2011). Coyote population estimates for Idaho are not specifically known and the IDFG does not provide any estimates because coyotes are numerous throughout the State so the IDFG does not commit any of their limited resources toward gathering population data on coyotes. However, an estimate suitable for purposes of this analysis can be made using information on coyote biology and population dynamics and tempering the "reasonableness" of the estimate by considering field observations of WS-Idaho personnel. These types of estimates of carnivore populations are based on knowledge of the species, experience and intuition and may be as accurate as those based on more scientific methods (Fritzell 1987).

Wildlife population trends reflect the cumulative impacts of all factors on the wildlife population of interest over time. States commonly use indices of population abundance and an affordable and effective means of monitoring trends in wildlife populations. For furbearers, IDFG monitors catch per unit effort (CPUE) as an indicator of population status over time (Nadeau 2014). These reports indicate that despite increasing numbers of trappers, there has been a stable to increasing statewide population trend for coyotes over the last 5 years.

The primary value of this information is in viewing it over time as a relative indicator of coyote abundance. Coyote abundance in Idaho appears to be somewhat cyclical. This is consistent with the conclusion of Stoddart (1984) that coyote densities in an area of southeast Idaho appeared to increase and decrease in response to changes in black-tailed jackrabbit abundance. Coyote populations in southern Idaho appear to be stable to increasing.

Coyotes are highly mobile animals with home ranges (territories) that vary by sex and age of the animal and season of the year (Pyrah 1984, Althoff 1978, Todd and Keith 1976). Coyote population densities will vary depending on the time of year, food abundance and habitat. In reviewing a series of studies where coyote abundance was assessed, Knowlton (1972) concluded that coyote densities may range as high as 5-6/mi2 under extremely favorable conditions, with 0.5-1.0/mi^2 seemingly realistic over much of their range. Davison (1980) reported that coyote densities were 0.7/mi^2 in an area of Butte County in southeastern Idaho. Clark (1972) conducted a study of coyotes in the Curlew valley area of southeastern Idaho and northern Utah. Coyotes in this study area were subject to substantial predator damage control efforts as well as heavy private fur harvesting efforts. Clark's five-year average population density, which included an apparent nine-year low, was estimated at 0.63/mi^2. Hurley et al. (2011) extrapolated data from 1998 population indices to estimate coyote populations in their southeastern Idaho study area at 0.57 coyotes/mi^2. Stoddart et al (2001) reported coyote densities in the Idaho National Engineering Laboratory in south-central Idaho ranging around 0.65 coyotes/mi^2 for 1975-1978, increasing to a brief peak of 6.5 coyotes/mi^2 in response to a period of high jackrabbit abundance. Berger et al. (2008) reported coyote densities of 0.70 coyotes/mi^2 in areas with wolves and 1.1 coyote/mi^2 in areas without wolves, with differences in density primarily attributable to differences in the transient portion of the population.

Additional estimates of coyote density can be obtained from WS-Idaho PDM efforts. During a two-week period in September of 1993, in response to a severe depredation problem, WS removed 30 coyotes from an approximately 12.5/mi^2 area within Payette County, suggesting a minimum density of around 2.4 coyotes per square mile (MIS 2015). Another estimate was obtained in February, 2015 on a mixture of private and BLM lands near Chesterfield, Idaho when 51 coyotes were removed from approximately 50 square miles during aerial shooting operations, suggesting a minimum winter density of about one coyote per square mile.

Based on a review of the information cited above, coyote densities for purposes of this assessment will be estimated conservatively at 0.6/mi^2 throughout Idaho. With Idaho being approximately 83,557 mi^2 in size, the population is conservatively estimated at 50,134 coyotes.

Coyote Population Impact Analysis. Coyotes were responsible for the largest percentage of requests for assistance in WS-Idaho. As a result of depredation control activities in response to these requests, WS-Idaho has taken an average of 3,081 coyotes per year statewide from FY 2011 through FY 2014 (Table 4.1a). The data indicates that WS-Idaho's coyote take has decreased annually over the four-year period with fluctuations ranging from 4,156 to 2,273 coyotes taken per year (Table 4.3). Based on the number of cooperative service agreements, county, State and federal budgetary constraints and projected future requests for assistance, WS-Idaho expects that future coyote removals for PDM would be similar to take during the last four years and therefore, the analysis would be suitable for projecting coyote removal and impacts into the foreseeable future. Maximum annual WS-Idaho coyote take that could occur under this alternative would be 6,000 coyotes per year.

Relative to impacts, coyotes are highly prolific and able to rebound rapidly from harvest pressure. While removing animals from small areas at the appropriate time can protect vulnerable livestock, immigration of coyotes from the surrounding area quickly replaces the animals removed (Stoddart 1984). Compensatory reproduction and mortality factors also contribute to rapid population recovery after removals and the ability of coyote populations to sustain relatively high levels of removals over time. A population model by Pitt et al. (2001, 2003) assessed the impact of removing a set proportion of a coyote population during one year and then allowing the population to recover. In the model, all populations recovered within one year when <60% of the population was removed. Recovery occurred within five years when 60-90% of the population was removed. Pitt et al. (2001, 2003) also evaluated the impact of removing a set proportion of the population every year for 50 years. When the removal rate was <60% of the population, the population size was the same as for an unexploited population. These findings are consistent with an earlier model developed by Connolly and Longhurst (1975) and revisited by Connolly (1995), which indicated that coyote populations could withstand an annual removal of up to 70% of their numbers and still maintain a viable population.

Table 4.3. Population impact analysis of WS-Idaho's coyote take and other coyote mortality[1] in Idaho during CY 2011 to CY 2014.

Coyote Mortality Information	2011	2012	2013	2014	4-Year Average[1a]
WS-Idaho's Intentional Take during PDM Activities[2]	4,156	3,120	2,772	2,273	3,080
Projected Maximum Annual take by WS-Idaho	6,000	6,000	6,000	6,000	6,000
Non-target, Unintentional Coyotes Killed by WS-Idaho During other Wildlife Damage Management Activities	0	0	0	0	0
Coyotes Taken by Private Hunters and Trappers	3,097[3]	4,152[4]	4,062[5]	4,042[6]	3,838
Coyotes Taken from Private Aerial Shooting[7]	165[8]	225[9]	220[10]	605[11]	304
Coyotes Reported to IDFG as Road Kills[12]	37	35	49	56	44
Total Statewide Mortality from all Known Causes	7,455	7,532	7,103	6,967	7,267
Projected Total Statewide Mortality if Maximum Take by WS	9,299	10,412	10,331	10,703	10,186
Estimated Statewide Population[13]	50,134	50,134	50,134	50,134	50,134

Coyote Mortality Information	2011	2012	2013	2014	4-Year Average[1a]
WS-Idaho's PDM Take as % of Estimated Idaho Population	8.3%	6.2%	5.5%	4.5%	6.1%
Non-target, Unintentional Coyotes Killed as % of Estimated Population	0%	0%	0%	0%	0%
Hunter and Trapper Take as % of Estimated Idaho Population	6.2%	8.3%	8.1%	8.1%	7.7%
Private Aerial Shooting Take as % of Estimated Idaho Population	0.33%	0.45%	0.44%	1.21%	0.61%
Road Kills as % of Estimated Idaho Population	0.07%	0.07%	0.10%	0.11%	0.09%
Cumulative Take as % of Estimated Idaho Population – Actual Take	14.9%	15.0%	14.2%	13.9%	14.5%
Projected Cumulative Take as % of Estimated Idaho Population if Maximum Take by WS	18.5%	20.8%	20.6%	21.3%	20.3%
Sustainable Harvest Per Year	60%	60%	60%	60%	60%

[1] Coyote mortality data only for WS-Idaho, private hunters and trappers, private aerial shooting and reported road kills.
Mortality from disease, natural death, predation, starvation, private predator control, etc. in Idaho is unknown.
[1a] Numbers may not add up to 100% due to rounding.
[2] Federal fiscal years – October 1 to September 30 of each year. MIS (2011, 2012, 2013, 2014).
[3] IDFG (2011*a*).
[4] IDFG (2012*a*).
[5] IDFG (2014*b*).
[6] S. Nadeau, IDFG, pers. comm. 2015.
[7] State fiscal years – July 1, to June 30, of each year. A three-year average is provided in the last column because data for 2014 is not available.
[8] ISADCB (2011*b*).
[9] ISADCB (2012).
[10] ISADCB (2013).
[11] ISADCB (2014).
[12] IDFG (2015*b*).
[13] Based on calculations in the "Coyote Population Information" section above.

In some local areas of Idaho, coyote removals may be conducted annually over a period of several years, but this not likely to result in depleted coyote populations. Repeated request for assistance at a particular site is an indication of ongoing coyote conflicts in the area and that coyote removal rates are within the sustainable harvest threshold of the population. These repeated requests for assistance are generally not an indication of a depleted coyote population. PDM efforts and coyote removals would be discontinued if coyote conflicts did not continue to persist and coyotes were not observed in the project area or an extended period of time occurred between coyote sightings, any of which could be indicative of low coyote densities. When wildlife populations decrease, the amount of effort that goes into finding or capturing animals of that species (catch per unit effort) increases. A review of catch per unit effort of coyotes removed through aerial operations by WS-Idaho was conducted for the period of FY 2005 through FY 2015 and no reduction in catch per unit effort were demonstrated that would be consistent with expectations of a reduced coyote population was observed. Therefore, the repeated PDM in some areas is more likely indicative of the cyclic pattern of removals by WS-Idaho and relatively rapid population recovery through immigration, reproduction and compensatory reproduction discussed below.

In a study by Gese (2005) a combination of aerial shooting and trapping removed approximately 44-61% and 51-75%, respectively, of an estimated coyote population from a 131 mi^2 project over the first and second year of a two-year study. Removals resulted in substantial reductions in coyote pack size and an associated decrease in density, but both pack size and density rebounded to pre-removal levels within 8 months. Radio collar data and shifts in age structure support the hypothesis that the coyotes colonizing the area after control were non-territorial individuals, which included yearlings from adjacent reproducing pairs of coyotes. The coyote population in the removal area had a younger age structure than the control area. Home range size did not vary for coyotes remaining after coyotes in adjacent territories were removed. Mean litter size did not differ substantially after the first year of winter and spring coyote removals, but increased the second year. Average litter size was correlated to the density of coyotes entering the breeding season. Increases in available prey the second year of the removals also have influenced coyote reproductive success, with a significant positive correlation between prey per coyote and litter size. However, lagomorph (i.e., rabbits) abundance increased in both the area with coyote removal and the control area without coyote removal and was not the result of coyote removals.

The seasonality of the coyote removal in the Gese (2005) study was similar to that which occurs in WS-Idaho, but the proportion of the coyote population removed in the Gese (2005) study was likely higher than typically occurs in Idaho. In a prolonged coyote population reduction effort during 1997-2002 in four select game management units in southeastern Idaho, the authors estimated that the intensive year-round removals had an average annual removal rate of 26% of the estimated coyote population for each of the project areas (Hurley et al. 2011). Estimated annual coyote removal rates ranged from 4% to 75% of the population in the four game management units. Although coyote removal efforts in the project areas were conducted at greater intensity than is the norm for PDM actions, removals exceeded 52% of the estimated population in only one game management unit and only for one year. For comparison, Appendix D provides data on WS-Idaho take of coyotes per county for the period of FY 2010 to FY 2015. Using average annual coyote take for each county for the 6-year period, coyote take per county ranged from 0.00034 to 0.22 coyotes/mi^2 with an average of 0.05 coyotes/mi^2. Using the coyote density estimate from above of 0.6 coyotes/mi^2, this equates to removal of 0.06% to 36.7% of the coyote population with an average removal rate of 8.3%.

WS-Idaho has cooperative service agreements and AWPs to work on approximately 18.6 million acres in Idaho (33% of all lands in Idaho), but on any given year, WS-Idaho will typically only work on about 6.2 million acres of land in Idaho (about 11.6% of all lands in Idaho). Therefore, coyote removal was limited to about 11.6% of the State's total area. Generally, coyote damage management occurs in only a fraction of each land unit under agreement; the area affected by coyote damage management is actually overestimated. The land area under agreement is provided to show the proportional breadth of area in which WS-Idaho works compared to the total range of coyotes in the State. This provides an indicator of the limited impact to overall state coyote populations. It should be noted that in areas where WS-Idaho conducts coyote damage management, that coyote populations are not completely removed. Rather, numbers are reduced to lower the potential for damage and or to remove specific coyotes associated with an ongoing damage problem. However, for small areas of WS-Idaho operation, the impact of coyote removals can extend beyond the actual work area because coyote home ranges often cross property boundaries.

Private coyote take may legally occur at any time in Idaho. However, it is reasonable to assume that much of the private take of coyotes occurs in the winter period when furs are prime and have monetary value. Sport hunters and trappers harvested an average of 3,838 coyotes during calendar year (CY) 2011 to CY 2014 and coyotes taken by private aerial shooting during CY 2011 to CY 2013 averaged 203 per year. The WS-Idaho coyote take for FY 2011 to FY 2014 averaged 3,081 per year. These data indicate that the four-year average total known number of coyotes taken (killed) in Idaho statewide was about 7,065 between CY 2011 and CY 2014. Based on the estimated coyote population in Idaho (50,134 coyotes), cumulative impacts analysis indicates that an average of approximately 14% of the population was removed each calendar year (Table 4.3). This level of cumulative impact is approximately one-fourth the threshold of annual removal of up to 60% that can be sustained by coyote populations (Pitt et al. 2001, 2003). In the unlikely event that WS-Idaho were to take the maximum number of coyotes allowed under this alternative, cumulative take would still be only 20% of the estimated population, approximately 1/3 of the sustainable harvest limit. Therefore, WS-Idaho concludes that the cumulative impact of all factors on coyote population in Idaho, including PDM by WS-Idaho, is not adversely impacting the size or sustainability of the Idaho coyote population. This conclusion is consistent with IDFG coyote population trend information (Nadeau 2014) and the U.S. General Accounting Office (GAO 1990) assessment regarding WS-Idaho's impacts on coyote populations in the western U.S. In Idaho, coyotes may be taken at any time without any requirement to report take, so not all coyote take in the State is reflected in the data in Table 4.3. However, given the low proportion of total known take relative to the sustainable harvest level for the population, unreported take would have to be almost three times the cumulative known take from all other causes to exceed the sustainable harvest level for the population.

Some individuals have expressed concern regarding the potential for lethal predator control to actually cause increased coyote populations and increased predation because of compensatory reproduction. Assessing the effect of damage management programs on coyote populations requires an understanding of the mechanisms and behaviors involved in regulating coyote demographic processes (Knowlton et al. 1999). Coyotes are territorial with territories spaced contiguously across the landscape like pieces of a puzzle and coyotes are territorial year-round residents, living in summer where they can survive in winter (Weaver 1979, Gantz 1990, Shivik et al. 1996). Hence, territory density remains relatively constant (Knowlton et al. 1999) with each territory maintained and controlled by a dominant pair of coyotes (alpha pair), with associated coyotes, including pups (beta coyotes) (Gese et al. 1996*a*, 1996*b*). In a study by Gese (1998) the alpha pair was lost and within a few weeks, the territory had been taken over by individuals from a neighboring pack. Populations also include transient and dispersing individuals. In addition, coyotes are monestrous (i.e., they produce only one litter per year) with only the dominant breeding pair typically producing a single litter per territory each spring (Kennelly and Johns 1976); beta females may also produce offspring, but this rarely occurs (Gese et al. 1996a). Because stable populations require that on average breeding adults only recruit enough surviving offspring into the breeding population to replace themselves, normally less than 10% of the young from a given pair of coyotes need to survive and reproduce to maintain the population (Knowlton et al. 1999). The other 90% die, disperse, or fail to reproduce.

Available food, especially in winter (Weaver 1979, Gese et al. 1996a), is often considered the major factor regulating coyote abundance (Gier 1968, Clark 1972), mediated through social dominance and territoriality (Knowlton and Stoddart 1983, Gese et al. 1988, 1989, Knowlton and Gese 1995, Windberg 1995). Some researchers believe food abundance regulates coyote numbers by influencing reproduction, survival, dispersal, space-use patterns and territorial density (Gier 1968, Knowlton 1972, Todd et al. 1981, Todd and Keith 1983, Mills and Knowlton 1991, Gese et al. 1996*a*). In contrast, Crabtree and Sheldon (1999) have suggested that litter size at birth (among coyotes) appears relatively unchanged with respect to changes in prey abundance and is largely unaffected by levels of human exploitation. Connolly and Longhurst (1975) demonstrated that coyote populations in exploited and unexploited populations do not increase at significantly different rates and that an area will only support a population to its carrying capacity.

Dispersal of "surplus" young coyotes is the main factor that keeps coyote populations distributed throughout their habitat. Such dispersal of subdominant animals removes surplus animals from higher density areas and repopulates areas where artificial reductions have occurred. Several studies (Connolly et al. 1976, Gese and Grothe 1995, Conner 1995, Shivik 1995, Sacks 1996, Shivik et al. 1996, Gese 1999) investigated the predatory behavior of coyotes and determined that the more dominant (alpha) animals (adult breeding pairs) were the ones that initiated and killed most of the prey items. Concerns that coyote removal activities might just exacerbate predation on livestock appear to be unfounded because the removal of local territorial (dominant, breeding adult) coyotes actually removes the individuals that are most likely to kill livestock and generally results in the immigration of subdominant coyotes that are less likely to prey on livestock.

Mountain Lion Population Information. Mountain lions inhabit many habitat types from desert to alpine environments, indicating a wide range of adaptability. They are closely associated with deer and elk because of their dependence upon these species for food. Lions are distributed across most of the suitable habitat in Idaho and mountain lion harvest is reported in most counties across the State (Nadeau 2008). However, management has kept lion populations at a low density in developed areas or areas with high road density (Nadeau 2008).

Female mountain lions typically breed for the first time between 22 and 29 months of age (Ashman et al. 1983), but initial breeding may be delayed until a territory has been established (Hornocker 1970). Mountain lions breed and give birth year round, but most births occur during late spring and summer following about a 90 day gestation period (Ashman et al. 1983, Seidernsticker et al. 1973, Robinette et al. 1961). One to six offspring per litter is possible, with an average of two to three young per litter.

Mountain lion density is closely tied to prey availability and social tolerance for other mountain lions (IDFG 2002). Prey availability is directly related to prey habitat quality that directly influences mountain lion nutritional health and reproductive and mortality rates. Studies indicate that as available prey increases, so do lion populations, but because mountain lions are territorial animals, the rate of population increase tends to decrease as lion density increases because mortality rates from intra specific fighting and cannibalism also increases and/or lions disperse into unoccupied or less densely occupied habitat. Laundré et al. (2007) evaluated the impacts of an increasing and then suddenly decreasing mule deer population on a hunted population of mountain lions in south central Idaho and northwestern Utah. The mountain lion population in the study area increased in response to increases in deer abundance. The population continued to increase and then peaked approximately four years after the deer population started to decline and then declined rapidly and eventually stabilized the last 3-4 years of the study, apparently in response to lower deer abundance. The relationship of the mountain lion to its prey and to other lions is why their densities do not reach levels observed in a number of other wildlife species. Population density and age composition are affected by exploitation rates (e.g., combined impacts of hunting, PDM and other human-induced mortality) with higher population densities, a greater proportion of transient lions, and younger age distribution in areas with higher exploitation rates (IDFG 2002).

Mountain lion densities in other states, based on a variety of population estimating techniques, range from a low of about 1/100 mi^2 to a high of 24/100 mi^2 (Johnson and Strickland 1992). An average density estimate for the western States was

7.5/100 mi^2 (Johnson and Strickland 1992). Population estimates have not been made for Idaho in recent years, though some radio collar mortality information in Idaho indicate a high rate of sustainable harvest in some areas. Given an estimated harvest rate statewide of approximately 15-20% (estimated to stabilize the population), Nadeau (2008) back- calculated and estimated a State population of about 2,000 to 3,000 mountain lions. Johnson and Strickland (1992) suggested that average density of mountain lions in Idaho is at least as high as 7.5/100 mi^2. Over the period of 1987-2002, Laundré et al. (2007) evaluated the impact of prey availability on a hunted mountain lion population in south central Idaho and Northwestern Utah. Mountain lion densities ranged from a low of 4/100 mi^2 to 7/100 mi^2. The Mountain Lion Foundation has used a gap habitat analysis map to estimate the amount of mountain lion habitat in the Idaho, and concluded there were approximately 49,314 square miles of potential mountain lion habitat in Idaho (Mountain Lion Foundation 2014). Using the Mountain Lion Foundation estimate of available habitat and the density ranges provided by Laundré et al. (2007) yields a State population estimate of approximately 2,000 – 3,400 mountain lions in the State, which is consistent with the estimate back-calculated by Nadeau (2008) from harvest data. Based on this information, we will use a range of 2,000 – 3,000 mountain lions in the population impact analysis calculations.

Mountain lion populations can sustain relatively moderate to heavy losses of adults and still maintain viable populations. Various studies on mountain lion population dynamics provide insights into harvest levels that can be sustained by populations. Robinette et al. (1977) reported a sustained annual mortality of 32% in Utah, while Ashman et al. (1983) noted a sustained annual mortality of at least 30% in Nevada. Ashman et al. (1983) believed that under "moderate to heavy exploitation (30%-50%)" mountain lion populations in their study area had the recruitment (reproduction and immigration) capability to rapidly replace annual losses.

Average annual harvest rate reported during the 1987-2002 study by Laundré et al. (2007) was estimated at 23.7% of the estimated harvestable population with maximum annual harvest rate of 47.6%. Human-caused mortality was greater for male lions (average = 36.6%) than for female lions (10.8%). Based on comparisons with areas with low or no hunting, Laundré et al. (2007) concluded that mortality from hunter harvest appeared to be additive to other sources of mortality in male lions. In females, hunter harvest appeared to be compensatory to other sources of mortality in female lions, particularly during the period when the population was increasing. Similarly, during the period of population decline, losses of females from natural mortality appeared to be the main cause for population decline and the low rate of hunter harvest during the first year of the decline seemed to have only a limited role.

Logan et al. (1996) determined the average annual rate of increase in the adult lions in a New Mexico study varied from 5-17% during a seven year period without exploitation that followed four years of intensive lion control, to 21-28% in a population where harvest and control was simulated by removing half of the lions from the study area. They concluded that rates of increase in mountain lion populations are density dependent, meaning that, as a population declines in relation to carrying capacity, the rate of increase becomes greater. This is a natural mechanism of wildlife populations in general that serves to protect species by enhancing the ability of populations to recover from declines. Logan et al. (1996) suggested that, for a lion population to remain at or near the maximum supported by the habitat, the carrying capacity, no more than 11% of the adults should be harvested per year. Logan's study was based on a relatively isolated population in the San Andres Mountains. An important distinction to be made is that the mountain lion population in Idaho is not isolated and because of available habitat, is mostly contiguous throughout much of the State. Logan et al. (1996) suggested that, for a population managed for control, the harvest level might need to exceed 28% per year to cause the population to decline substantially. It appears that a viable population can be maintained at about 50% of carrying capacity with harvest levels that are at or below 16.5% or, in some years, as high as 29.8% (Table 4.4).

The mountain lion sport harvest in Idaho was at a record high in the late 1990's topping at about 800 mountain lions (Nadeau 2008). From 2011 to 2014, the average annual mountain lion harvest was 510 individuals, with harvest increasing an average of 6.5% annually for those 4 years (Table 4.4).

Table 4.4. Population impact analysis of WS-Idaho's mountain lion take and other mountain lion mortality[1] in Idaho during 2011 to 2014.

Mountain Lion Mortality Information	2011	2012	2013	2014	4-Year Average[1a]
WS-Idaho's Take During PDM Activities[2]	2	4	7	1	3.5
Projected Maximum Annual Take by WS	15	15	15	15	15
Non-target, Unintentional Mountain Lions Killed by WS-Idaho During Wildlife Damage Management Activities	0	1[3]	0	1[4]	0.5
Statewide Mountain Lion Harvest During Sport Hunting Season	467[5]	499[5]	510[5]	564[6]	510
Other Known Mountain Lion Mortality[7]	22	25	36	24	26.75
Mountain Lions Reported to IDFG as Road Kills[8]	3	7	7	7	6
Total Statewide Mortality from all Known Causes	494	529	560	597	545
Projected Total Statewide Mortality if Maximum Take by WS	507	540	568	611	556.5
Estimated Statewide Population[9]	2,000-3,000	2,000-3,000	2,000-3,000	2,000-3,000	2,000-3,000
WS-Idaho's PDM Take as % of Estimated Idaho Population	0.1% to 0.087	0.2% to 0.13%	0.35% to 0.23%	0.05% to 0.03%	0.18% to 0.12%
Non-target, Unintentional Mountain Lions Killed as % of Estimated Population	0%	0.05% to 0.03%	0%	0.05% to 0.03%	0.025% to 0.017%

Hunter Harvest as % of Estimated Idaho Population	23.4% to 15.6%	25% to 16.6%	25.5% to 17%	28.2% to 18.8%	25.5% to 17%
Other Known Mountain Lion Mortality as % of Estimated Idaho Population	1.1% to 0.73%	1.25% to 0.83%	1.8% to 1.2%%	1.2% to 0.8%	1.34% to 0.9%
Road Kills as % of Estimated Idaho Population	0.15% to 0.10%	0.35% to 0.23%	0.35% to 0.23%	0.35% to 0.23%	0.3% to 0.20%
Cumulative Total Mortality as % of Estimated Idaho Population	24.7% to 16.5%	26.4% to 17.6%	28% to 18.7%	29.8% to 19.9%	27.2% to 18.2%
Projected Cumulative Take as % of Estimated Idaho Population if Maximum Take by WS	25.4% to 16.9%	27% to 18%	28.4% to 18.9%	30.6% to 20.4%	27.8% to 18.6%

[1] Mountain lion mortality data only for WS-Idaho and other known and documented mortality events. Mortality from disease, natural death, predation, weather, starvation, etc. in Idaho is unknown and unavailable.

[1a] Numbers may not add up to 100% due to rounding.

[2] Take based on federal fiscal year (October 1, to September 30, of each year). MIS (2011, 2012, 2013, 2014).

[3] Non-target mountain lions killed while conducting other PDM activities.

[4] Non-target unintentional mountain lions killed while conducting Wolf Damage Management activities.

[5] IDFG (2011*c* 2012*c*, 2013*c*). Take data is only available by State fiscal year (July 1, to June 30, of each year).

[6] J. Rachael, IDFG, pers. comm., 2015.

[7] J. Rachael, IDFG, pers. comm., 2015. Reported mountain lion mortality from illegal kill, incidental trapping mortality, wounding loss, natural mortality, unknown causes and other. Data provided by calendar year.

[8] IDFG (2015*b*). Based on calendar year.

[9] Nadeau (2008).

Mountain Lion Population Impact Analysis. Known statewide mountain lion mortality is provided in Table 4.4 and will be used to measure direct and indirect cumulative impacts. Mountain lion take by WS-Idaho (includes those lions targeted and killed and lions that were unintentionally killed during conduct of other wildlife damage management activities) varied over the past four years from a low of two each in 2011 and 2014 and a high of seven in 2013. However, this level of mortality was very low when considered as a percentage of the total statewide estimated population and those lions killed from all other known mortality (sport hunting, road kills, etc.). All mountain lions intentionally removed by WS-Idaho during those four years were for the protection of livestock. There were no incidents of lion control to protect human health and safety or to reduce predation on wildlife. The total mortality from WS-Idaho, when combined with other known forms of mortality, also known as cumulative take, for the four-year average is 18.2% to 27.2% which is below the levels of 30% to 32% reported by Ashman et al. (1983) and Robinette et al (1977), respectively, for sustaining a viable mountain lion population and consistent with the average annual mortality rate reported by Laundré et al. (2007). The highest cumulative take in any one given year was during 2014 (19.9% to 29.8%). Maximum projected take in the unlikely event that WS-Idaho takes the maximum number of mountain lions allowed under this alternative would increase average cumulative take to 27.8 to 18.6%.

One of the goals of IDFG mountain lion management is to maintain mountain lion populations in Idaho at levels sufficient to assure their future recreational, ecological, intrinsic, scientific and educational values, and to limit conflicts with human enterprise and values. The IDFG Mountain Lion Management Plan (IDFG 2002) outlines the various population and harvest metrics used to monitor the well-being of the State mountain lion population. All WS-Idaho take of mountain lions is reported to IDFG as part of this monitoring process. Available population data is used in an ongoing iterative process to adjust sport harvest limits to maintain State mountain lion population management objectives (IDFG 2002, 2013c). IDFG has indicated that the number of mountain lions removed by WS-Idaho's agents annually in response to depredations on livestock is insignificant and has no cumulative adverse effect on the overall population in Idaho (J. Rachael, IDFG, pers. comm., 2015). Finally, effects on the mountain lion population may be overestimated because the lowest population estimate was used to err on the side of caution, further reducing the likelihood that WS-Idaho would have any adverse effect on the mountain lion population in Idaho.

Black Bear Population Information. The age structure of black bear populations is one indicator of population health. Because black bears are relatively long-lived animals, black bears in the older age classes should be found in a healthy population. If a population is overexploited, the older aged black bears will not be present or will be in low proportions (IDFG 1998).

In Idaho, female black bears generally reach reproductive maturity at four years of age. Following a seven to eight month gestation (about 220 days), they produce an average of 1.5-1.8 cubs per female. In Idaho, sport hunters are required to report black bear harvested within ten days of kill (IDFG 2012*b*). Lightly hunted areas in Idaho have a high ratio of adults to subadults (70:30), a high percentage of adult males (35%) and a median age of 7.5 years. Data collected from heavily hunted populations showed adult:subadult ratios at 40:60, fewer adult males (21%) and a median age of 2.5-3.5 years (IDFG 1998). IDFG (J. Rachael, pers. comm. 2015) and Black Bear Society (2011) estimate the statewide black bear population at about 20,000 animals.

Black Bear Population Impact Analysis. Current black bear harvest, whether by hunting, IDFG, WS-Idaho, livestock producers or other causes and cumulative impacts of all other sources of mortality, is not causing a decline in black bear populations and black bear populations in Idaho appear to be stable (J. Rachael, IDFG, pers. comm., 2015). During the 2011-2014 Idaho hunting seasons, sport hunters removed an average of 2,333 black bears per year (or about 11.7% of the total estimated population), while WS-Idaho removed an average of <7 black bears/year (this includes intentional and unintentional take; Table 4.5), or about <0.04% of the total estimated population. Other known types of mortality on black bears reported to IDFG include killed by automobiles (road kill), illegal kills, hunter wounding loss, natural mortality and unknown causes amounts to <0.07% of the total estimated population. Combining all these black bear mortality factors, the annual mortality averaged about 11.8% per year of the estimated population. The allowable harvest level cited for black bears has been estimated at 20% of the population (CDFG 2001) and Mace and Chilton-Radandt (2011) reported that black bears in Montana returned to a sustainable mortality rate of approximately 16% when they estimated the reproductive rate of 0.945 and a mean age of first reproduction of six years. Given the stable population trend for black bears in the State, cumulative impacts on the black bear population from all causes, including take by WS-Idaho, is not adversely impacting the black bear population.

Table 4.5. Population impact analysis of WS-Idaho's black bear take and other known black bear mortality[1] in Idaho during 2011 to 2014.

Black Bear Mortality Information	2011	2012	2013	2014	4-Year Average[1a]
WS-Idaho's Taken during PDM Activities[2]	4	4	3	6	4.25
Non-target Black Bears Killed by WS-Idaho During Wildlife Damage Management Activities	2	3	3	5	3.25
Projected Maximum Annual Take by WS	25	25	25	25	25
Black Bears Harvested by Sport Hunters[3]	2,509[4]	2,248[5]	2,393[6]	2,180[7]	2,333
Other Known Black Bear Mortality[8]	8	5	3	4	5
Black Bears Reported to IDFG as Roadkills[9]	8	10	6	6	7.5
Total Statewide Mortality from all Known Causes	2,531	2,270	2,408	2,201	2,353
Projected Total Statewide Mortality if Maximum Take by WS	2,550	2,288	2,427	2,215	2,378
Estimated Statewide Population[10]	20,000	20,000	20,000	20,000	20,000
WS-Idaho's PDM Take as % of Estimated Idaho Population	0.02%	0.02%	0.015%	0.03%	0.012%
Non-target Black Bears Killed as % of Estimated Population	0.01%	0.015%	0.015%	0.03%	0.011%
Hunter Harvest as % of Estimated Idaho Population	12.5%	11.2%	12.0%	10.9%	11.7%
Other Known Black Bear Mortality as % of Estimated Population	0.04%	0.025%	0.015%	0.02%	0.025%
Road Kills as % of Estimated Idaho Population	0.04%	0.05%	0.03%	0.03%	0.04%
Cumulative Take as % of Estimated Idaho Population	12.6%	11.4%	12.0%	11.0%	11.8%
Projected Cumulative Take as % of Estimated Idaho Population if Maximum Take by WS	12.7%	11.4%	12.1%	11.1%	11.8%
Sustainable Harvest Per Year	16%-20%	16%-20%	16%-20%	16%-20%	16%-20%

1 Black bear mortality data. Some mortality from disease, natural death, predation, weather, starvation, etc. is undocumented and unknown.

1a Numbers may not add up to 100% due to rounding.

2 Federal fiscal years – October 1 to September 30 of each year. MIS (2011, 2012, 2013, 2014).

3 State fiscal years – July 1, to June 30, of each year.

4 IDFG (2011*b*).

5 IDFG (2012*b*).

6 J. Rachael, IDFG, pers. comm., 2015.

[7] S. Nadeau, IDFG, pers. comm., 2015.

[8] Reported black bear mortality from illegal kill, incidental trapping mortality, wounding loss, natural mortality, unknown causes and other (J. Rachael, IDFG, pers. comm., 2015). Data provided by calendar year.

[9] IDFG (2015*b*). Based on calendar year.

[10] J. Rachael, IDFG, pers. comm., 2015 and BBS (2011).

Grizzly Bear Population Information. The grizzly bear is one of two subspecies of the brown bear (*Ursus arctos*) which occupy North America. Grizzly bears are a wide-ranging species with little evidence that they are territorial. Home range sizes vary and the home ranges of adult grizzly bears frequently overlap. Most areas currently inhabited by the species are represented by contiguous, relatively undisturbed mountainous habitat exhibiting high topographic and vegetative diversity (USFWS 2014). The grizzly bear was listed as a threatened species on July 28, 1975. Historically, the grizzly bear ranged from the Great Plains to the Pacific Ocean and from the northern United States border with Canada to the southern border with Mexico. Currently, in the contiguous United States, the grizzly population has been reduced to roughly two percent of its former range, presently occupying only parts of Montana, Idaho, Wyoming and Washington.

Availability of springtime habitat is a concern throughout the current range of the species. The grizzly bear is an opportunistic feeder that uses a wide variety of plant and animal food sources (IGBST 2013). The grizzly bear diet varies seasonally and yearly depending on the availability of high-quality foods. In spring, grasses, sedges, roots, moss and bulbs are primary food sources. During summer and early autumn, berries are essential, with bulbs and tubers also eaten, with individuals sometimes traveling hundreds of miles during the autumn to reach areas of favorable food supplies, such as areas of high berry production (USFWS 1993). They also consume insects, fungi and roots and dig mice, ground squirrels and marmots (*Marmota* spp.) out of their burrows year-round. Spawning fish and army cutworm moths (*Euxoa auxiliaries*) are an important food source where they are abundant. Grizzly bears consume whitebark pine seeds contained in red squirrel (*Tamiasciurus hudsonicus*) cone caches (Mattson and Jonkel 1990). Studies show that in years when the whitebark pine seed crop is low, there is an exponential increase in human-grizzly bear conflicts (Mattson et al. 2001). This is likely due to grizzly bears seeking alternative food sources, such as clover (*Trifolium* spp.) and yampa (*Perideridia* spp.), that occur at lower elevations and closer to humans (USFWS 2014).

In an effort to facilitate consistency in the management of grizzly bear habitat within and across ecosystems, the Interagency Grizzly Bear Guidelines were developed by the Interagency Grizzly Bear Committee (IGBC) (51 FR 42863, November 26, 1986) for use by land managers. The IGBC developed specific land management guidelines for use in each of the five ecosystems. Recovery zones also have been established for the grizzly bear and include areas large enough and of sufficient habitat quality to support a recovered grizzly bear population (Figure 4.1).

According to the Grizzly Bear Recovery Plan (USFWS 1993), a recovery zone is defined as that area in each grizzly bear ecosystem within which the population and habitat criteria for achievement of recovery will be measured. Areas outside of recovery zones may provide habitat that grizzly bears will use, but are not considered necessary for the survival and recovery of this species. The area outside the recovery zone, but within the ten-mile buffer area, is managed to consider and protect grizzlies and their habitat whenever possible recognizing that population and mortality data within this zone are collected and pertinent to recovery criteria (USFWS 1993). Beyond the ten-mile buffer, grizzly bear mortalities or populations are not considered when determining whether recovery goals have been met; however, protection is still accorded to the grizzly bear under the ESA (USFWS 2014).

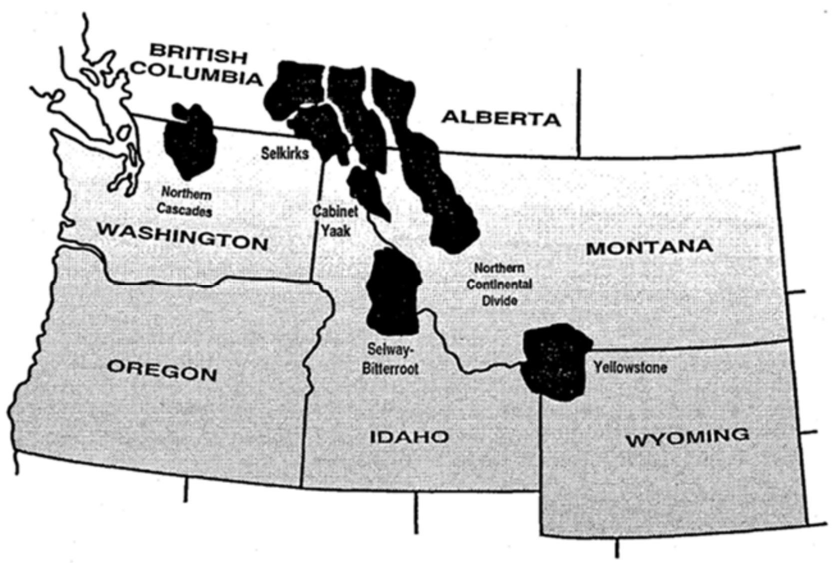

Figure 4.1. Grizzly bear ecosystems in the conterminous 48 States (USFWS 1993).

The current Grizzly Bear Recovery Plan (USFWS 1993) outlines recovery strategies for the various grizzly bear ecosystems. The Plan defines a recovered population as one that can sustain the existing level of known and unknown human-caused mortality that exists in the ecosystem and is well-distributed throughout the recovery zone (USFWS 2014).

<u>Greater Yellowstone Ecosystem (GYE).</u> The 9,209-square mile GYE recovery zone includes portions of Wyoming, Montana and Idaho and portions of five National Forests (Beaverhead-Deer Lodge, Bridger-Teton, Custer-Gallatin, Shoshone and Caribou- Targhee), Yellowstone and Grand Teton National Parks, John D. Rockefeller Memorial Parkway, portions of adjacent private and State lands and lands managed by the BLM (USFWS 2014).

Cabinet-Yaak (CYE). The CYE in northwestern Montana and northeastern Idaho has more than 1,900 square miles of forested and mountainous habitat occupied by grizzly bears. The population in the Cabinet Mountains portion of this area is estimated at approximately 42 animals (USFWS 2013). This population is connected to populations of grizzly bears to the north of the United States border with Canada, as interchanges of radio-collared grizzly bears across the border have been documented (USFWS 1993).

Selkirk Ecosystem (SE). The SE of northwestern Idaho, northeastern Washington and southeastern British Columbia includes about 1,080 square miles in the U.S. portion and about 875 square miles in the Canadian portion of the recovery zone. The Selkirk recovery zone is the only defined grizzly bear recovery zone that includes part of Canada because the habitat in the United States portion is not of sufficient size to support a minimum population. The habitat is contiguous across the border and radio-collared grizzly bears are known to move back and forth across the border. Therefore, the grizzly bears north and south of the border are considered one population (USFWS 1993).

Bitterroot Ecosystem (BE). The BE is located in central Idaho and consists of approximately 5,781 square miles (3.7 million acres, USFWS 2012*a*) and is part of one of the largest contiguous blocks of federal land remaining in the lower 48 States (USFWS 1996*a*).

Grizzly Bear Population Impact Analysis. Human activities can result in direct mortality of grizzly bears, as well as indirect negative effects by displacing grizzly bears to less suitable habitats (Wakkinen and Kasworm 2004; Schwartz et al. 2006). The most effective way to minimize the risk of adverse interactions between humans and grizzly bears is to provide spatial separation between areas of human activity and areas of grizzly bear activity. In areas where such separation is not possible, providing large areas of secure habitat that include seasonal habitats may reduce the potential for contact and minimize risk of disturbance and illegal mortality (Mace and Waller 1998). Managing public motorized access to grizzly bear habitat is one of the most common and effective ways to maintain a level of separation between grizzly bears and humans.

Factors affecting grizzly bears in the action area are associated with motorized and dispersed recreational use and forest management activities, including timber harvest. These actions reduce the amount of secure habitat available to grizzly bears, reducing their reproductive health and lead to mortality. Direct human-caused mortality is also a large threat to the grizzly bear. This kind of mortality can occur in several ways: (1) mistaken identification by big game hunters; (2) malicious killing; (3) defense of human life or property; or (4) management removals. Grizzly bears are removed to defend human life or property, usually because grizzly bears have become dangerously bold as a result of food conditioning and habituation at campsites, lodges, resorts and private residences or they become habituated predators of livestock (USFWS 2014).

GYE. Demographic recovery criteria outlined for the GYE include: (1) sufficient reproduction to offset mortality to ensure population viability; (2) adequate distribution of breeding females throughout the area; and (3) an annual evaluation of total human-caused mortality that will ensure a recovered population (WGFD 2016). All demographic criteria for the GYE have been met and the USFWS has proposed removing this distinct population segment from listing under the ESA (81 FR 13173).

The best available information suggests the GYE grizzly bear population trend is increasing (Table 4.6). However, the long-term conservation of the population continues to depend largely on managing grizzly bear-human conflicts, which often results in human-caused mortality of grizzly bears. Years in which natural grizzly bear food production and availability are high can result in younger age classes of grizzly bears accustomed to fairly good food availability. A year of drought and poor food production can compel grizzly bears to search widely for food. Such wide ranging movements can bring grizzly bears into closer contact with humans, increasing grizzly bear-human conflicts and resultant control/management actions. As the habitat area most remote from the other remaining grizzly bear habitat, the Yellowstone ecosystem has been the primary focus of grizzly recovery efforts to date. This work has been very successful; the grizzly population numbers and distribution here have exceeded target recovery levels for the last several years. The population of adult female grizzly bears, for example, has grown from a low point in 1983 of less than 30 to more than 100 today. Recovery work continues to reduce grizzly bear mortalities and ensure habitat standards for maintaining a recovered population (USFWS 2014).

Table 4.6. 2010 population trend by Recovery Zone (USFWS 2011*b*).

Recovery Zone	Trend (% change Annually
Greater Yellowstone	+4-7%
Cabinet-Yaak Ecosystem	-3.8%
Selkirk Ecosystem	+1.9%
Bitterroot Ecosystem	NA

CYE. The 1993 CYE demographic criteria are: (1) six females with cubs over a running six-year average both inside the recovery zone and within a ten mile area immediately surrounding the recovery zone, excluding Canada; (2) 18 of 22 BMUs occupied by females with young from a running six-year sum of verified sightings and evidence; and, (3) known human-caused mortality not to exceed four percent of the population estimate based on the most recent three-year sum of females with cubs. Furthermore, no more than 1.2 percent of total human-caused mortality shall be females. These mortality limits cannot be exceeded during any two consecutive years for recovery to be achieved.

Presently, grizzly bear numbers are low in this ecosystem and therefore, the goal for human- caused mortality is zero. In both the CYE and the SE, none of the demographic recovery criteria have been met (Kasworm et al. 2014, Wakkinen et al. 2009). In addition, the existence of adequate regulatory mechanisms for population and habitat management through the development of a conservation strategy must be demonstrated (USFWS 2014). The most recent data indicate that population status is below recovery goals in the CYE for the distribution of females with young in BMUs and exceeds the six-year average of female mortality in the recovery zone. Threats to grizzlies in this recovery zone include incomplete habitat protection measures (motorized access management), unsustainable levels of human-caused mortality, small population size and associated risks (including stochastic or detrimental environmental effects) and population fragmentation that resulted in genetic isolation (USFWS 2014).

SE. For the SE, the 1993 demographic recovery criteria are: (1) six females with cubs over a running six-year average both inside the recovery zone and within a ten mile area immediately surrounding the recovery zone, including Canada; (2) seven of ten BMUs on the U.S. side occupied by females with young from a running six-year sum of verified sightings and evidence; and (3) known human-caused mortality not to exceed four percent of the population estimate based on the most recent three-year sum of females with cubs. Furthermore, no more than 30 percent of this four percent mortality limit shall be females. These mortality limits cannot be exceeded during any two consecutive years for recovery to be achieved. Presently, grizzly bear numbers are so small in this ecosystem that the mortality goal is zero human-caused mortality. Proctor et al. (2012) compiled data from multiple sources and conducted Deoxyribonucleic Acid (DNA)-based population surveys to estimate a population size of 83 grizzly bears in the SE, with 25-30 in the U.S. (USFWS 2013), which is based on expert opinion rather than systematic inventory. Threats to grizzlies in this recovery zone include incomplete habitat protection measures (motorized access management), inadequate regulatory mechanisms including a lack of food storage orders on some jurisdictions, human-caused mortality, small population size and population fragmentation that resulted in genetic isolation. Although this population may be slowly increasing and reconnecting with adjacent populations, high levels of human caused mortality and a lack of regulatory mechanisms, in British Columbia and the U.S., still threaten this population (USFWS 2014).

BE. There is no known grizzly bear population in the BE. However, on September 3, 2007, a black bear hunter shot a grizzly bear in the upper Kelly Creek drainage within the BE. Results of the DNA analysis conducted on the bear determined that this individual originated in the Selkirk Mountains of north Idaho and this bear had not been previously captured. Prior to this incident, grizzly bear occurrence had not been confirmed for more than 60 years in the BE. However, subsequent extensive

DNA and camera surveys in the area in 2008 and 2009 found no evidence of grizzly bears (B. Conard, USFWS, pers. comm. 2015). Grizzly bear recovery in this ecosystem could be expedited by the reintroduction of grizzly bears from other areas. An environmental impact statement and Record of Decision addressing the impacts of reintroducing grizzly bears into the Bitterroot Ecosystem in east central Idaho was released in 2000. However, the USFWS has not been authorized to move forward with this plan (USFWS 2014).

WS-Idaho responds to reported grizzly bear livestock depredation by conducting a thorough investigation and determining if the cause of death is related to grizzly bears. On an average, WS-Idaho receives about four to six reports per year of grizzly bear predation on livestock and about half of those reports are confirmed. Most issues relating to conflicts with grizzly bears may be resolved using nonlethal methods. In cases involving grizzly bear predation on livestock, management actions follow the provisions of the USFWS regulations on grizzly bear management and the MOU between the ISADCB and IDFG. The MOU states that the Board is responsible for prevention and control of damage caused by predatory animals and other vertebrate pests, including T/E species within the State of Idaho as described in Section 25-128, Idaho Code, and further states that the Board has delegated such responsibility to WS-Idaho. Both parties (IDFG and WS-Idaho) shall consult and cooperate in any trapping efforts. WS-Idaho will be the lead in investigating depredations and trapping grizzly bears in depredation situations. WS-Idaho and IDFG will work closely together during any livestock related grizzly bear incident. From FY 2011 to FY 2014, WS-Idaho has only killed one grizzly bear at the recommendation of the IDFG and under the authorization of the USFWS (Table 4.7). That particular grizzly bear was from the GYE. The USFWS' Grizzly Bear Recovery Coordinator authorized WS-Idaho to capture and euthanize the responsible grizzly bear because it was associated with multiple instances of predation on livestock. Removal was also authorized under a federal subpermit (USFWS 2012*b*) as allowed by Section (i)(C) and (D) of the grizzly bear 4(d) rule, 50 CFR 17.40(b). When issuing the permit, the USFWS determined that removal of the individual grizzly bears would not jeopardize the continued existence of the grizzly bear population in the GYE. While federally protected under the ESA, WS anticipates that requests to use lethal methods to resolve damage by grizzly bears will be extremely rare and will not exceed 1 grizzly bear per year, with no take occurring in most years. If the USFWS determines that bears in the GYE have recovered sufficiently to warrant removal from the federal list of threatened and endangered species, maximum WS-Idaho impact on grizzly bears would not exceed 3 bears per year with only 1 bear taken lethally and the remaining two bears captured and relocated. After delist, all take would continue to be authorized on a case-by-case basis by IDFG with population monitoring by IDFG and the USFWS (particularly for the first 5 years after delisting) to ensure that cumulative impacts on the grizzly bear population do not adversely affect the recovery of the population. All WS-Idaho take is expected to come from the GYE ecosystem. Given USFWS and IDFG oversight and monitoring and case by case authorization of removals by IDFG and USFWS, WS lethal removal of grizzly bears will not jeopardize the grizzly bear population (USFWS 2014).

Table 4.7. Population impact analysis of WS-Idaho's grizzly bear take and other known grizzly bear mortality[1] in Idaho and in the GYE, Selkirk and Cabinet Yaak during 2011 to 2014.

Grizzly Bear Mortality Information	2011	2012	2013	2014	4-Year Average[1a]
Idaho Information					
WS-Idaho's Taken during PDM Activities[2]	0	1[2a]	0	0	0.25
Non-target, Unintentional Grizzly Bears Killed or Taken by WS-Idaho During Wildlife Damage Management Activities	0	0	0	0	0
Known and Probable Grizzly Bear Mortality in Idaho Other Than WS-Idaho Take[2b]	0	1	4	NA[3]	1.67
Grizzly Bears Reported to IDFG as Road Kills and Were Killed in Idaho[4]	0	0	0	0	0
Total Statewide Mortality from all Known Causes[2a]	0[5]	2[6]	4[7, 8]	NA[3]	2
Estimated Statewide Population[9]	NA[3]	NA[3]	NA[3]	NA[3]	NA[3]
GYE, Selkirk, and Cabinet-Yaak Information					
Known and Probable Non-human Caused Grizzly Bear Mortality[2a, 9a]	7[5]	21[9b]	6[7]	NA[3]	11.3
Known and Probable Human-Caused Grizzly Bear Mortality	17[5, 10]	16[9b, 10]	13[7, 10]	3[11]	15.3
Known Grizzly Bear Mortality in the GYE due to Repeated Livestock Depredations[2a]	20[5, 12]	16[9b, 12]	10[7, 12]	NA[3]	15.3
Total Mortality from all Known Causes[2a]	47[5, 10]	58[9b, 10]	32[7, 10]	NA[3]	45.7
Estimated GYE, Selkirk, and Cabinet-Yaak Grizzly Bear Population[2a]	715[5, 13, 14]	840[9b, 13, 14]	863[7, 13, 14]	NA[3]	806
Total Mortality as % of Estimated Population[2a]	6.6%%	6.9%	3.7%	NA[3]	5.7%
WS-Idaho Mortality as a % of the Total Estimated Population	0%	0.12%	0%	0%	0.03%

1 Grizzly bear mortality data. Some mortality from disease, natural death, predation, weather, starvation, etc. is unreported, undocumented and unknown.
1a Numbers may not add up to 100% due to rounding.
2 Federal fiscal years – October 1 to September 30 of each year. The grizzly bear killed in 2012 was removed under USFWS permit and authority after repeated livestock depredations. MIS (2011, 2012, 2013, 2014).
2a This grizzly bear was killed under the direction of the USFWS and IDFG and as authorized in a USFWS permit.
2b A three-year average is provided in the last column because data for 2014 is not available.
3 Data/information not available.
4 IDFG 2015*b*.
5 Cain (2012).
6 Cain (2013) and WS-Idaho.

[7] Cain (2014).

[8] Three mortalities were human-related and still under investigation, while the cause of one grizzly bear mortality is undetermined.

[9] The IDFG or USFWS does not provide an estimate for the Idaho portion of the GYE, Selkirk Mountains and Cabinet-Yaak ecosystems due to the transient nature of grizzly bears.

[9a] A three-year average is provided for 2011, 2012 and 2013 in the last column because data for 2014 is incomplete and by providing a four-year average would skew the data.

[9b] Cain (2013).

[10] Based on estimates provided by USFWS (2011*b*) for the Cabinet-Yaak and Selkirk Ecosystems. Human-caused mortality between 1980 and 2008 for the Cabinet-Yaak is 1.3 grizzly bears per year and Selkirk is 1.6 grizzly bears per year.

[11] Mortality not available for GYE.

[12] Data only available for GYE.

[13] Kasworm et al. (2010). Estimated population in the Cabinet-Yaak is 42 grizzly bears.

[14] Proctor et al. (2012). Estimated population in the Selkirk is 80 grizzly bears.

Bobcat Population Information. Bobcats reach reproductive maturity at approximately 9 to 12 months of age and may have one to six kittens following a two-month gestation period (Crowe 1975, Koehler 1987). Reported bobcat densities, as summarized by McCord and Cardoza (1982), have ranged between 0.1-7.0/mi^2. They may live up to 14 years, but annual mortality is as high as 47% (Rolley 1985). Analysis of Idaho bobcat harvest data suggests that populations are healthy, productive and stable and that current harvest levels are not detrimental to bobcat populations (IDFG 2014*b*). Knick (1990) estimated that bobcat densities on his study area in southeastern Idaho ranged from 0.35/mi^2 during a period of high jackrabbit densities, to about 0.04/mi^2 during a period of low jackrabbit densities. Bailey (1974) estimated bobcat densities in the same area to average about 0.14/mi^2. Given IDFG's assessment that bobcat populations in Idaho are healthy and productive, we will conservatively estimate bobcat densities in Idaho at 0.1/mi^2 or about 8,356 animals.

Bobcat Population Impact Analysis. Bobcats taken by private hunters and trappers averaged 1,108 animals per year from 2011 to 2014 (Table 4.8). WS-Idaho averages killing less than two bobcats per year during FY 2011 to FY 2014 while conducting PDM activities (does not include one non-target bobcat that was unintentionally killed when conducting coyote depredation management). The total known annual mortality averages about 1,116 bobcats per year, or about 13.3% of the estimated statewide population. A bobcat population model developed by Knick (1990) based on 7 years of intensive bobcat research in southeastern Idaho indicated that bobcat populations can sustain harvest levels of up to 20% of the population. Rolley (1985) also estimated that bobcats can sustain a 20% annual harvest. The lethal removal of less than two bobcats per year by WS-Idaho would represent 0.02% of the statewide population estimated at 8,356 and 0.12% of the allowable harvest level in the State. WS-Idaho expects the annual level removal of bobcats to remain similar to previous activities and will not exceed 15 bobcat per year. Based on the findings of Rolley (1985), the number of bobcats lethally removed by WS-Idaho is unlikely to reach a magnitude where adverse effects would occur to the bobcat population. Given the stable population trend for bobcats in the State, cumulative impacts of the factors listed above, including licensed harvest and take by WS-Idaho, is not adversely impacting the State bobcat population.

Table 4.8. Population impact analysis of WS-Idaho's bobcat take and other known bobcat mortality[1] in Idaho during 2011 to 2014.

Bobcat Mortality Information	2011	2012	2013	2014	4-Year Average[1a]
WS-Idaho's Take during PDM Activities[2]	0	6	0	1	1.75
Projected Maximum Annual take by WS-Idaho	15	15	15	15	15
Non-target, Unintentional Bobcats Killed by WS-Idaho During PDM Activities	0	0	1	0	0.25
Bobcats Taken by Private Hunters and Trappers[3]	1,000[4]	1,190[5]	1,189[6]	1,053[7]	1,108
Bobcats Reported to IDFG as Road Kills[8]	1	9	5	7	5.5
Total Statewide Mortality from all Known Causes	1,001	1,205	1,195	1,061	1,116
Projected Total Statewide Mortality if Maximum Take by WS	1,016	1,214	1,209	1,075	1,129
Estimated Statewide Population[9]	8,356	8,356	8,356	8,356	8,356
WS-Idaho's PDM Take as % of Estimated Idaho	0%	0.07%	0%	0.01%	0.02%
Non-target, Unintentional Bobcats Killed as % of Estimated Population	0%	0%	0.01%	0%	0.0025%
Hunter and Trapper Take as % of Estimated Idaho Population	12.0%	14.2%	14.3%	12.6%	13.3%
Road Kills as % of Estimated Idaho Population	0.01%	0.11%	0.06%	0.08%	0.06%
Cumulative Take as % of Estimated Idaho Population	12.0%	14.2%	14.3%	12.7%	13.3%
Projected Cumulative Take as % of Estimated Idaho Population if Maximum Take by WS	12.2%	14.5%	14.5%	12.9%	13.5%
Sustainable Harvest Per Year	20%	20%	20%	20%	20%

[1] Bobcat mortality data only for WS-Idaho, private hunters and trappers and road kill reports submitted to IDFG. Mortality from disease, natural death, predation, starvation, private predator control, etc. in Idaho is unknown.
[1a] Numbers may not add up to 100% due to rounding.
[2] Federal fiscal years – October 1 to September 30 of each year. MIS (2011, 2012, 2013, 2014).
[3] State fiscal years – July 1, to June 30, of each year.
[4] IDFG (2011*a*).
[5] IDFG (2012*a*).
[6] IDFG (2014*b*).
[7] S. Nadeau, IDFG, pers. comm. 2015.
[8] IDFG (2015*b*). Based on calendar year.
[9] Based on calculations in the "Bobcat Population Information" section above.

Raccoon Population Information. Raccoons are one of the most omnivorous animals, feeding on carrion, garbage, birds, mammals, insects, crayfish, mussels, a wide variety of grains, various fruits, other plant materials and most or all foods prepared for human or animal consumption (Sanderson 1987). Raccoon populations vary considerably, depending on food availability and habitat suitability and populations can vary widely between seasons and years due to disease and harvest (Gehrt 2003). Raccoons generally do well in human-altered areas and the highest reports of raccoon densities usually occur in urban/suburban areas. Typical rural densities run from 2.6-70 raccoons per square mile with lowest densities (1-2.6) usually occurring at the northern edge of the species range (Gehrt 2003). Population densities of raccoons in the Rolling Plains ecological region of Texas was estimated at 43/mi^2 (USDA 2013*b*). The population of raccoons, under management authority of the IDFG, have not been estimated by the IDFG in Idaho. The population is considered by the IDFG to be robust enough that in 2008, they reclassified the raccoon from a "furbearer" to a "predatory animal" and allowing raccoons to be killed by any legal means without harvest limits. For the purpose of this EA we are using a conservative (i.e., it is below established literature density numbers so we may err on the side of caution) average raccoon density estimate of 1/mi^2, which would indicate a statewide population estimate of more than 83,556 raccoons (i.e., 1 raccoon per square mile with the State having about 83,556 square miles).

Raccoon Population Impact Analysis. Between FY 2011 and FY 2014, WS-Idaho intentionally lethally removed an average of 21.5 raccoons each year (Table 4.9). Additionally, WS-Idaho unintentionally lethally removed an average of three raccoons as non-targets during this same time period. The highest annual lethal removal by WS-Idaho between FY 2011 and FY 2014 occurred in FY 2011 when 36 raccoons were removed (target and non-target combined), which represents less than 0.04% of the FY 2011 population in Idaho at 83,556 raccoons. The annual allowable harvest level for raccoons has been estimated to range from 49% to 59% for the long-range maintenance of the species (Sanderson 1987). WS-Idaho expects its annual lethal removal of raccoons to remain similar to previous years, including non-target removal and does not anticipate the lethal removal of raccoons to increase substantially. Cumulative impacts on the raccoon population from all known sources of mortality are also very low. Substantial undocumented mortality likely occurs, but that mortality would have to be close to ten times the level of documented mortality for the population to reach levels close to the limit conservatively estimated sustainable level for the State population. Given the wide distribution and relative abundance of raccoons in the State and the ability of raccoons to thrive in human-altered landscapes, cumulative impacts will not adversely impact the Idaho raccoon population.

Table 4.9. Population impact analysis of WS-Idaho's raccoon take and other known raccoon mortality[1] in Idaho during 2011 to 2014.

Raccoon Mortality Information	2011	2012	2013	2014	4-Year Average[1a]
WS-Idaho's Take during PDM Activities[2]	34	30	12	10	21.5
Non-target, Unintentional Raccoons Killed by WS-Idaho During Wildlife Damage Management	2[3]	5[4]	1[3]	4[3]	3
Projected Maximum Annual take by WS-Idaho	50	50	50	50	50

Raccoons Taken by Private Hunters and Trappers[5]	1,519[6]	1,432[7]	1,457[8]	1,984[9]	1,598
Raccoons Reported to IDFG as Road Kills[10]	12	80	112	96	75
Total Statewide Mortality from all Known Causes	1,567	1,547	1,582	2,094	1,698
Estimated Statewide Population[11]	83,556	83,556	83,556	83,556	83,556
Projected Total Statewide Mortality if Maximum Take by WS	1,581	1,562	1,619	2,130	1,723
WS-Idaho's PDM Take as % of Estimated Idaho Population	0.04%	0.03%	0.02%	0.01%	0.02%
Non-target, Unintentional Raccoons Killed as % of Estimated Population	0.002%	0.01%	0.001%	0.005%	0.004%
Hunter and Trapper Take as % of Estimated Idaho	1.8%	1.7%	1.7%	2.5%	2%
Road Kills as % of Estimated Idaho Population	0.02%	0.10%	0.14%	0.12%	0.09%
Cumulative Take as % of Estimated Idaho Population	2.0%	1.8%	1.9%	2.5%	2%
Projected Cumulative Take as % of Estimated Idaho Population if Maximum Take by WS	3.8%	3.7%	3.8%	5.1%	4.1%
Sustainable Harvest Per Year	49% to 59%	49% to 59%	49% to 59%	49% to 59%	49% to 59%

1 Raccoon mortality data only for WS-Idaho, private hunters and trappers and road kill reports submitted to IDFG. Mortality from disease, natural death, predation, starvation, private predator control, etc. in Idaho is unknown.
1a Numbers may not add up to 100% due to rounding.
2 Federal fiscal years – October 1 to September 30 of each year. MIS (2011, 2012, 2013, 2014).
3 Raccoon(s) killed while conducting Rodent Damage Management Activities (beaver damage control).
4 Three raccoons killed while conducting other PDM activities and two raccoons killed while conducting Rodent Damage Management activities (beaver damage control).
5 State fiscal years – July 1, to June 30, of each year.
6 IDFG (2011*a*).
7 IDFG (2012*a*).
8 IDFG (2014*b*).
9 S. Nadeau, IDFG, pers. comm. 2015.
10 IDFG (2015*b*). Based on calendar year.
11 Based on calculations in the "Raccoon Population Information" section above.

Badger Population Information. Badgers are under the management authority of the IDFG. Due to the prevalence of badgers in Idaho, the IDFG does not conduct regular population surveys, but they are considered demonstrably widespread, abundant, and secure in Idaho (Digital Atlas of Idaho Project 2015). Available population studies, although localized, estimated that the Curlew Valley on the Utah-Idaho border supported 1/mi^2 (Lindzey 1971) and Messick and Hornocker (1981) found 13/mi^2 in southwestern Idaho and noted that densities may be higher during periods when juveniles are dispersing. Densities of 5 badger/mi^2 were recorded in the National Elk Refuge in northwestern Wyoming (Lindzey 2003). For purposes of this analysis, we will conservatively use the low density estimate of 1/mi^2 for Idaho statewide, or about 83,556 badgers.

Badger Population Impact Analysis. Between FY 2011 and FY 2014, WS-Idaho intentionally lethally removed an annual average of 16.25 badgers and an average of 3.75 badgers unintentionally. The highest annual lethal removal by WS-Idaho between FY 2011 and FY 2014 occurred in FY 2012 when 33 badgers were removed (target and non-target removal), which represents less than 0.02% of a population in Idaho at 83,556 badgers. Sustainable harvest for badger populations has been estimated at 30-40% annually (Boddicker 1980) or about 25,067 to 33,423 in Idaho. WS-Idaho expects the annual lethal removal of badgers to remain similar to previous years, including non-target removal with maximum annual removal not to exceed 100 badgers per year. Based on the limited removal that could occur, impacts of WS-Idaho actions would be of very low magnitude. Cumulative impacts on the badger population from all known sources of mortality are also very low and well below sustainable limits for the population.

Table 4.10. Population impact analysis of WS-Idaho's badger take and other known badger mortality[1] in Idaho during 2011 to 2014.

Badger Mortality Information	2011	2012	2013	2014	4-Year Average[1a]
WS-Idaho's Take during PDM Activities[2]	10	29	18	8	16.25
Non-target Badgers Killed by WS-Idaho During Wildlife Damage Management Activities[2]	4[3]	4[4]	6[5]	1[6]	3.75
Projected Maximum Annual take by WS-Idaho	100	100	100	100	100
Badgers Taken by Private Hunters and Trappers[7]	501[8]	290[9]	245[10]	231[11]	317
Badgers Reported to IDFG as Road Kills[12]	67	26	24	40	39.25
Total Statewide Mortality from all Known Causes	582	349	293	280	376
Projected Total Statewide Mortality if Maximum Take by WS	668	416	369	371	456
Estimated Statewide Population[13]	83,556	83,556	83,556	83,556	83,556
WS-Idaho's PDM Take as % of Estimated Idaho Population	0.01%	0.03%	0.001%	0.01%	0.02%
Non-target, Unintentional Badgers Killed as % of Estimated Population	0.005%	0.005%	0.007%	0.001%	0.004%
Hunter and Trapper Take as % of Estimated Idaho Population	0.60%	0.35%	0.29%	0.28%	0.38%
Road Kills as % of Estimated Idaho Population	0.08%	0.03%	0.03%	0.05%	0.05%
Cumulative Take as % of Estimated Idaho Population	0.70%	0.42%	0.35%	0.34%	0.45%
Projected Cumulative Take as % of Estimated Idaho Population if Maximum Take by WS	0.80%	0.50%	0.44	0.44%	0.54%
Sustainable Harvest Per Year	30% to 40%	30% to 40%	30% to 40%	30% to 40%	30% to 40%

1 Badger mortality data only for WS-Idaho, private hunters and trappers and road kill reports submitted to IDFG. Mortality from disease, natural death, predation, starvation, private predator control, etc. in Idaho is unknown.

1a Numbers may not add up to 100% due to rounding.

2 Federal fiscal years – October 1 to September 30 of each year. MIS (2011, 2012, 2013, 2014).

3 Two badgers were killed while conducting PDM activities and two were killed while conducting wildlife damage management activities.

4 Three badgers were killed while conducting PDM activities and one was killed while conducting wildlife damage management activities.

4 Five badgers were killed while conducting PDM activities and one was killed while conducting wildlife damage management activities.

[6] Killed while conducting PDM activities.
[7] State fiscal years – July 1, to June 30, of each year.
[8] IDFG (2011*a*).
[9] IDFG (2012*a*).
[10] IDFG (2014*b*).
[11] S. Nadeau, IDFG, pers. comm. 2015.
[12] IDFG (2015*b*). Based on calendar year.
[13] Based on calculations in the "Badger Population Information" section above.

Striped Skunk Population Information. The striped skunk is the most common member of the *Mustelidae* family. Striped skunks have increased their geographical range in North America with the clearing of forests. Striped skunks are capable of living in a variety of environments, including agricultural lands and in urban/suburban areas (Rosatte 2003).

Striped skunk densities can be highly variable depending on habitat quality, with densities reported in the literature range from 0.26 to 67/mi^2 (Ferris and Andrews 1967, Verts 1967, Lynch 1972, Bjorge et al. 1981, Broadfoot et al. 2001, Hansen et al. 2004). Many factors may contribute to the widely differing population densities, including type of habitat, food availability, disease, season of the year and geographic area (Storm and Tzilkowski 1982). Specific population density estimates for striped skunks in Idaho are not available because, although managed by the IDFG, their population is not counted. For purposes of this analysis, we will conservatively estimate skunk densities at 0.3/mi^2 throughout Idaho, for an estimated population of about 41,778 animals.

Striped Skunk Population Impact Analysis. The highest known striped skunk mortality in Idaho is harvest from private hunters and trappers, which averaged 786 individuals during the past four hunting/trapping seasons. IDFG collects road kill mortality from the public, but this form of mortality may be underestimated because the collection of data is voluntary. WS-Idaho has taken an average of 32 striped skunks per year for the last four fiscal years, with a peak of 64 (target and non-target) in FY 2011 and a low of 17 in FY 2014 (Table 4.11). The highest annual lethal removal by WS-Idaho was in FY 2011 and represented less than 0.15% of a population in Idaho at 41,778 striped skunks. Striped skunk populations can sustain an annual harvest rate of 60% annually (Boddicker 1980) or about 25,067 in Idaho. WS-Idaho expects the annual lethal removal of striped skunks to remain similar to previous activities, including non-target removal and striped skunk take is not expected to exceed 100 skunks annually. Based on the limited removal that could occur, impacts would be of very low magnitude. Additionally, should WS-Idaho's requests to remove striped skunks increase substantially, the cumulative impacts to the striped skunk population would remain low. Cumulative impacts of known take on the skunk population are also low relative to sustainable harvest levels. Given the wide distribution and relative abundance of the striped skunk population and the capacity of the species to adapt to human-altered landscapes, this alternative will not have an adverse cumulative impact on the striped skunk population.

Table 4.11. Population impact analysis of WS-Idaho's striped skunk take and other known striped skunk mortality[1] in Idaho during 2011 to 2014.

Striped Skunk Mortality Information	2011	2012	2013	2014	4-Year Average[1a]
WS-Idaho's Take during PDM Activities[2]	60	24	25	17	31.5
Non-target, Unintentional Striped Skunks Killed by WS-Idaho During Wildlife Damage Management Activities[2]	4[3]	6[4]	5[3]	4[3]	4.75
Projected Maximum Annual take by WS-Idaho	100	100	100	100	100
Striped Skunks Taken by Private Hunters and Trappers[5]	809[6]	847[7]	742[8]	813[9]	803
Striped Skunks Reported to IDFG as Roadkills[10]	14	14	5	14	11.75
Total Statewide Mortality from all Known Causes	887	891	777	844	850
Projected Total Statewide Mortality if Maximum Take by WS	923	971	849	923	914
Estimated Statewide Population[11]	25,067	25,067	25,067	25,067	25,067
WS-Idaho's PDM Take as % of Estimated Idaho Population	0.24%	0.1%	0.1%	0.08%	0.13%
Non-target, Unintentional Striped Skunks Killed as % of Estimated Population	0.02%	0.02%	0.02%	0.01%	0.02%
Hunter and Trapper Take as % of Estimated Idaho Population	3.23%	3.38%	2.96%	3.24%	3.20%
Road Kills as % of Estimated Idaho Population	0.06%	0.06%	0.02%	0.06%	0.28%
Cumulative Take as % of Estimated Idaho Population	3.54%	3.55%	3.10%	3.37%	3.39%
Projected Cumulative Take as % of Estimated Idaho Population if Maximum Take by WS	3.68%	3.87%	3.39%	3.37%	3.39%
Sustainable Harvest Per Year	60%	60%	60%	60%	60%

1 Striped skunk mortality data only for WS-Idaho, private hunters and trappers and road kill reports submitted to IDFG. Mortality from disease, natural death, predation, starvation, private predator control, etc. in Idaho is unknown.
1a Numbers may not add up to 100% due to rounding.
2 Federal fiscal years – October 1 to September 30 of each year. MIS (2011, 2012, 2013, 2014).
3 Killed while conducting PDM activities.
4 Killed while conducting Rodent Damage Management activities (yellow-bellied marmot damage control).
5 Data is only available by State fiscal year – July 1, to June 30, of each year.
6 IDFG (2011*a*).
7 IDFG (2012*a*).
8 IDFG (2014*b*).
9 S. Nadeau, IDFG, pers. comm. 2015.
10 IDFG (2015*b*). Based on calendar year.
11 Based on calculations in the "Striped Skunk Population Information" section above.

Red Fox Population Information. Red fox are the most common and well-known species in the genus *Vulpes* and are the most widely distributed nonspecific predators in the world (Voigt 1987). Foxes are regarded as nuisance predators in many regions, preying on wildlife and livestock (Ables 1969, Andrews et al. 1973, Tabel et al. 1974, Tullar et al. 1976, Pils and Martin 1978, Sargeant 1978, Voigt 1987, Allen and Sargeant 1993). Because of its importance to humans, it has been the subject of much study (Devenish-Nelson et al. 2013). Investigations have revealed that red fox are extremely adaptive with much diversity in their behavior and habitats. Voigt and Earle (1983) and Gese et al. (1996*a*) showed that red foxes avoided coyotes but coexisted in the same area and habitats. Recently, large-scale spatial analysis of long-term changes in coyote density associated with the restoration of wolf populations appear to indicate an increase in red fox density in areas where there are lower coyote populations in response to wolf introductions (Newsome and Ripple 2014).

The density of red fox populations is difficult to determine because of the species' secretive and elusive nature, large home ranges, and capture difficulty (Cypher 2003). However, the red fox has a high reproductive rate and dispersal capacity similar to coyotes and can withstand high mortality within the population (Allen and Sargeant 1993, Voigt 1987, Voigt and MacDonald 1984, Harris 1979, Pils and Martin 1978, Storm et al. 1976, Andrews et al. 1973, Phillips and Mech 1970). Storm et al. (1976) stated that 95% of the females (43.6% were less than one year old) bred successfully in a population in Illinois and Iowa. Rowlands and Parkes (1935) and Creed (1960) reported that male red fox breed in their first year. Litter sizes averaged about 4.7 offspring for 13 research studies and litters with as many as 14 and 17 offspring have been reported (Storm et al. 1976, Voigt 1987). Ables (1969) and Sheldon (1950) reported that more than one female was observed at the den and suggested that red fox have "helpers" at the den, a phenomena observed in coyotes and other canids. Reported red fox population densities have been as high as over 50/mi^2 (Harris 1977, MacDonald and Newdick 1982, Harris and Rayner 1986) where food was abundant. Ontario population densities are estimated at 2.6 animals/mi^2 (Voigt 1987) and Sargeant (1972) reported one fox den/3 mi^2. For purposes of this analysis, we will conservatively estimate red fox densities at 0.3/mi^2 throughout Idaho. This would equate to a total population in the analysis area of about 25,067 red fox.

Red fox dispersal serves to replace and equalize fox densities over large areas and over a wide range of population densities. Annual harvests in localized areas in one or more years will likely have little impact on the overall population in subsequent years, but may reduce localized predation (Allen and Sargeant 1993). Phillips (1970) stated that fox populations are resilient and in order for fox control operations by trapping to be successful, pressure on the population must be almost continuous. Phillips (1970) and Voigt (1987) further stated that habitat destruction that reduces prey numbers, water and cover will affect fox populations to a greater extent than a short-term over harvest. Red fox social structure and population dynamics are similar to that for coyote and red fox populations are likely to exhibit the same resilience to harvest as that modeled for coyotes above (Pitt et al. 2001), which is 70% annually.

Red fox were uncommon in Idaho in the early 1900s, but their populations apparently began increasing and expanding around 1960 (Fichter and Williams 1967) and they have been relatively abundant in southern Idaho for the last several decades. Their populations are believed to be stable to decreasing (Steve Nadeau, IDFG, pers. comm. 2015). Concerns have been expressed by sportsmen and some legislators that high red fox populations may be having a detrimental impact on pheasant populations and these factors presumably entered into the decision by the Idaho Fish and Game Commission to institute the current year-round hunting and trapping season for red fox across most of southern Idaho. Increases in red fox populations and their potential impacts on sage-grouse were also considered and addressed in recently revised sage-grouse management guidelines (Connelly et al. 2000), which now include a recommendation that red fox populations should be discouraged in sage-grouse habitat.

Red Fox Population Impact Analysis. Between FY 2011 and FY 2014, WS-Idaho intentionally lethally removed an average of 27.5 red fox each year Table 4.12). Additionally, WS-Idaho unintentionally lethally removed an average of 0.75 red fox as non-targets during this same time period. The highest annual lethal removal by WS-Idaho between FY 2011 and FY 2014 occurred in FY 2013 when 36 red fox were removed (target and non-target removal), which represents less than 0.15% of a population in Idaho at 25,067 red fox. Red fox populations can safely sustain an annual harvest rate of 70% annually or about 17,547 in Idaho. WS-Idaho expects the annual lethal removal of red fox to remain similar to previous activities, including non-target removal and does not expect annual removal to exceed 75 red fox per year. Based on the limited removal that could occur, impacts would be of very low magnitude. Given the stable to increasing trend for red fox in southern Idaho and the low magnitude of impact of known mortality relative to sustainable harvest for the population, the proposed action would not have an adverse impact on the State red fox population.

Table 4.12. Population impact analysis of WS-Idaho's red fox take and other known red fox mortality[1] in Idaho during 2011 to 2014.

Red Fox Mortality Information	2011	2012	2013	2014	4-Year Average[1]
WS-Idaho's Take during PDM Activities[2]	35	32	35	8	27.5
Non-target Red Fox Killed by WS-Idaho During Wildlife Damage Management Activities[2]	1[3]	2[3]	2[4]	1[5]	1.5
Projected Maximum Annual take by WS-Idaho	75	75	75	75	75
Red Fox Taken by Private Hunters and Trappers[6]	1,043[7]	1,227[8]	1,292[9]	1,368[10]	1,232
Red Fox Reported to IDFG as Road Kills[6, 11]	15	21	24	26	21.5
Total Statewide Mortality from all Known Causes	1,094	1,282	1,353	1,403	1,283

Projected Total Statewide Mortality if Maximum Take by WS	1,133	1,322	1,391	1,469	1,329
Estimated Statewide Population[12]	25,067	25,067	25,067	25,067	25,067
WS-Idaho's PDM Take as % of Estimated Idaho Population	0.14%	0.13%	0.14%	0.03%	0.11%
Non-target Red Foxes Killed as % of Estimated Population	0.004%	0.008%	0.008%	0.004%	0.006%
Hunter and Trapper Take as % of Estimated Idaho Population	4.2%	4.9%	5.15%	5.46%	4.93%
Road Kills as % of Estimated Idaho Population	0.06%	0.08%	0.1%	0.1%	0.09%
Cumulative Take as % of Estimated Idaho Population	4.4%	5.1%	5.4%	5.6%	5.1%
Projected Cumulative Take as % of Estimated Idaho Population if Maximum Take by WS	4.5%	5.35	5.5%	5.9%	5.3%
Sustainable Harvest Per Year	70%	70%	70%	70%	70%

[1] Red fox mortality data only for WS-Idaho, private hunters and trappers and road kill reports submitted to IDFG. Mortality from disease, natural death, predation, starvation, private predator control, etc. in Idaho is unknown.
[1a] Numbers may not add up to 100% due to rounding.
[2] Federal fiscal years – October 1 to September 30 of each year. MIS (2011, 2012, 2013, 2014).
[3] Killed while conducting wildlife damage management activities.
[4] One was killed while conducting Rodent Damage Management activities (beaver damage control) and the other during wildlife damage management.
[5] Killed while conducting PDM activities.
[6] State fiscal years – July 1, to June 30, of each year.
[7] IDFG (2011*a*).
[8] IDFG (2012*a*).
[9] IDFG (2014*b*).
[10] S. Nadeau, IDFG, pers. comm. 2015.
[11] IDFG (2015*b*). Based on calendar year.
[12] Based on calculations in the "Red Fox Population Information" section above.

Feral Cat Population Information. Feral cats are common in many parts of Idaho, especially close to human habitation. Feral cats are not part of the native environment and when left abandoned in the wild, they are considered an ecological pest and very efficient predators killing millions of native wildlife annually (ABC 2015) and competing with native predators. Cats, including feral (unowned) and domestic (owned or pets), have been either a direct or indirect factor in 33 bird species extinctions and have been identified by the science community as one of the world's worst invasive species (ABC 2015). Scientists from the Smithsonian Conservation Biology Institute and the USFWS estimate that approximately 2.4 billion birds and 12.3 billion mammals are killed in the United States by outdoor cats ever year (ABC 2015). Primary responsibility for addressing damage or threats of damage caused by feral cats occurs with county agencies, local authorities or the resource owner/manager. Cats, whether feral or domestic, are not managed by the State in Idaho, and as such, there are no population estimates for feral cats. Nationally, there are an estimated 30 million feral cats (Luoma 1997) and an estimated 63 million pet cats (Nassar and Mosier 1991) in the continental United States (Pimentel et al. 2000).

WS-Idaho infrequently receives requests for assistance associated with feral cats and had only documented one damage occurrence, four threat occurrences and one nuisance occurrence associated with damage caused by feral cats between FY 2011 through FY 2014. The majority of complaints received with feral cats is predation on poultry. As part of those requests for assistance, WS-Idaho lethally removed four feral cats between FY 2011 and FY 2014 to alleviate damage or threats of damage (Table 4.13). WS-Idaho also lethally remove feral cats unintentionally during wildlife damage management activities targeting other animals. Between FY 2011 and FY 2014, Idaho lethally removed two feral cats unintentionally during activities targeting other predators.

Feral Cat Population Impact Analysis. Executive order 13112 directs federal agencies to, amongst other things, work within the capacity of available resources and agency mission and authorities to control populations of invasive species. However, WS-Idaho does not anticipate the lethal removal of feral cats to exceed 30 cats per year. Based on the limited number of animals taken and infrequent nature of lethal removal that could occur, including non-target removal, impacts would be nonexistent or of very low magnitude. The limited removal of feral cats by WS-Idaho would have minimal effects on statewide populations. Some local populations may be temporarily reduced at a specific site if cats were removed using nonlethal (cage trapping) or lethal methods. In those cases where feral cats were causing damage or were creating a nuisance and complete removal of the local population could be achieved, this could be considered as providing some benefit to the natural environment because feral cats are not considered part of the native ecosystem. The lethal removal of cats that could occur by WS-Idaho would be minor compared to the number killed by animal control and humane organizations in Idaho each year.

Table 4.13 Population impact analysis of WS-Idaho's feral cat take and other known feral cat mortality[1] in Idaho during 2011 to 2014.

Feral Cat Mortality Information	2011	2012	2013	2014	4-Year Average[1a]
WS-Idaho's Take during PDM Activities[2]	0	3	1	0	1
Non-target Feral Cats Killed by WS-Idaho During PDM Activities[2]	0	0	1	1	0.5
Projected Maximum Annual take by WS-Idaho	30	30	30	30	30
Feral Cats Reported to IDFG as Road Kills[3]	72	112	131	150	116.25
Total Statewide Mortality from all Known Causes	72	115	133	151	117.75
Projected Total Statewide Mortality if Maximum Take by WS	102	142	161	180	146
Estimated Statewide Population[4]	Unk	Unk	Unk	Unk	Unk

[1] Feral cat mortality data only for WS-Idaho, private hunters and trappers and road kill reports submitted to IDFG. Mortality from disease, natural death, predation, starvation, private predator control, etc. in Idaho is

unknown.
[1a] Numbers may not add up to 100% due to rounding.
[2] Federal fiscal years – October 1 to September 30 of each year. MIS (2011, 2012, 2013, 2014).
[3] IDFG (2015*b*). These animals were reported as "domestic cats" because in most cases pet cats are difficult to differentiate from feral cats unless they are wearing some type of ownership identification, however, most likely, the majority of these reported animals are feral cats. Based on calendar year.
[4] Unknown. Information on the estimated statewide population is not available.

Feral and Free-ranging Dog Population Information. Feral and free-ranging dogs are somewhat common in Idaho and damage associated with these dogs can be extensive. Feral and free-ranging dogs kill or injure livestock and poultry and present a problem for human health and safety (*e.g.*, attacks and disease threats). From FY 2011 to FY 2014, WS-Idaho documented an average of 138 damage or threat occurrences per year associated with feral and free-ranging dogs in Idaho. Most of the damage or threat occurrences were associated with agricultural resources, primarily livestock. Feral and free-ranging dogs killed or injured 145 head of livestock between FY 2011 and FY 2014 and caused $79,428 in livestock losses. Feral and free-ranging dogs also pursue and prey on native wildlife, such as deer and upland game. From FY 2011 to FY 2014, there were 12 instances of this type of conflict. Primary responsibility for dog control rests with county and local authorities or the resource owner/manager. However, because of Idaho's cooperative wildlife damage management responsibilities and the seriousness of the problem, WS-Idaho personnel are authorized to control feral and free-ranging dogs for the protection of livestock, poultry and human health and safety. Efforts to address damage associated with feral and free-ranging dogs would be conducted in accordance with WS-Idaho Policy 2.3401 for controlling dogs. Feral and free-ranging dogs are not part of the native environment and when left abandoned in the wild, feral and free-ranging dogs are often considered ecological concerns because they can prey on native wildlife. There are also some concerns that pet and feral and free-ranging dogs may cross-breed with gray wolves which may have adverse impacts on the behavior and genetics of the wolf population. Feral and free-ranging dogs are not managed by the State in Idaho, and as such, there are no population estimates for feral and free-ranging dogs. Nationally, the estimated pet dog population in the United States is 77.8 million in 54.4 million homes (American Pet Products Manufacturers Association 2016). However, an unknown percentage of those animals have become wild (Bergman et al. 2009).

Feral and Free-ranging Dog Population Impact Analysis. In response to damage and threat occurrences involving dogs, WS-Idaho removed an average of nine target feral and free-ranging dogs from FY 2011 to FY 2014, with the highest annual removal occurring in FY 2011 when 19 feral and free-ranging dogs were removed intentionally (see Table 4.14). WS-Idaho also unintentionally lethally removed two feral and free-ranging dogs during other damage management activities conducted from FY 2011 and FY 2014. The lethal removal of feral and free-ranging dogs by WS-Idaho is considered to have little impact on the human environment because feral and free-ranging dogs are not an indigenous component of ecosystems in Idaho. In addition, the annual removal of feral and free-ranging dogs by WS-Idaho is minor in comparison to the thousands killed by animal control and humane organizations in Idaho each year. WS-Idaho addresses feral and free-ranging dogs at the request of the local authority for animal control and, thus, this action would likely occur in the absence of involvement by WS-Idaho. WS-Idaho expects the annual lethal removal of feral and free-ranging dogs in Idaho to remain similar to previous years.

Table 4.14. Population impact analysis of WS-Idaho's feral and free-ranging dog take and other known feral and free-ranging dog mortality[1] in Idaho during 2011 to 2014.

Feral and Free-ranging Dog Mortality Information	2011	2012	2013	2014	4-Year Average[1]
WS-Idaho's Take during PDM Activities[2]	19	8	8	1	9
Non-target Feral and Free-ranging dogs Killed by WS-Idaho During Wildlife Damage Management Activities[2]	0	1[3]	0	1[4]	0.5
Projected Maximum Annual take by WS-Idaho	25	25	25	25	25
Domestic Dogs Reported to IDFG as Road Kills[5]	20	27	29	25	25.25
Total Statewide Mortality from all Known Causes	39	36	37	27	34.75
Projected Total Statewide Mortality if Maximum Take by WS	45	52	54	52	50
Estimated Statewide Population[6]	Unk	Unk	Unk	Unk	Unk

[1] Feral and free-ranging dog mortality data only for WS-Idaho and road kill reports submitted to IDFG. Mortality from disease, natural death, predation, starvation, private predator control, etc. in Idaho is unknown.
[1a] Numbers may not add up to 100% due to rounding.
[2] Federal fiscal years – October 1 to September 30 of each year. MIS (2011, 2012, 2013, 2014).
[3] Feral/free-ranging dog killed while conducting wildlife damage management activities.
[4] Feral/free-ranging dog killed while conducting other PDM activities.
[5] IDFG (2015*b*). These animals were reported as "domestic dogs" because in most cases pet dogs are difficult to differentiate from feral and free-ranging dogs unless they are wearing some type of ownership identification, however, most likely, the majority of these reported animals are feral and free-ranging dogs. Based on calendar year.
[6] Unknown. Information on the estimated statewide population is not available.

Common Raven Population Information. Ravens are a migratory bird managed under the MBTA by the USFWS. They are among the most widely distributed bird species in the world and can be found in major portions of North America, Europe, Asia and North Africa (Boarman and Heinrich 1999). Although ravens are protected under the MBTA, they are generally a resident species. However, some wandering and local migration occurs with immature and non-breeding birds (Goodwin 1986). Typical clutch size is between three and seven chicks. Immature birds which have left their parents form flocks with non-breeding adults. These flocks tend to roam and are relatively loose-knit (Goodwin 1986).

The raven is an omnivorous species known to feed on live meat, carrion, crops, garbage, eggs and birds, small mammals, amphibians, reptiles, fish and insects (Boarman and Heinrich 1999). In many areas of the West, the raven is seen as an indicator of human disturbance because it is often associated with garbage dumps, sewage ponds, highways, agricultural fields, urbanization and other typical signs of human-altered landscapes (Boarman 1993, Kristen and Boarman 2003, Howe et al. 2014). Supplemental food sources such as garbage, crops, road-kills, etc., may give the raven an advantage over other less opportunistic feeders and appear to have allowed the raven population to increase precipitously in some areas. In a study by Howe et al. (2014) in eastern Idaho, ravens readily used anthropogenic structures for nesting with 58% of the 82 nests located on transmission poles and an additional 14% on other human-made towers. Additionally, structures such as power poles and other towers provide elevated perching and nesting locations in areas where these features were nonexistent or uncommon (Howe et al. 2014).

WS-Idaho receives a wide range of complaints each year relating to raven damage. Agriculture related complaints have included damage to livestock by pecking the eyes and other soft tissues on newborn livestock (primarily calves and lambs) and pecking at the scabs of newly branded cattle. Other types of agricultural damage caused by ravens include consuming and contaminating livestock feed and feeding on grains and other crops. Non-agricultural property damage complaints have included constructing nests and causing damage to electrical lines and communication towers resulting in power outages and fouling of non-residential buildings. Health related complaints have included entering garbage containers and strewing trash, accumulation of fecal material on equipment used at landfills, pecking holes and damaging waterproof tarpaulins at landfills used to prevent waste water from leaching in the groundwater and carrying trash from landfills to nearby residential areas.

WS-Idaho PDM actions to address raven damage would most commonly involve technical assistance using nonlethal control or lethal control approaches or a combination of the two, as described under the "Proposed Action." WS-Idaho conducts its' raven damage management operations on a local population level, which are often not adequately represented with large scale area trend analysis. Local population levels can be very high in comparison to a regional level, particularly in areas of human disturbance which tend to attract corvid species.

Population trends reflect the cumulative impact of all factors such as habitat change, disease, collisions with vehicles and predation on a wildlife population. One strategy the WS program uses to assess cumulative impact is to compare the anticipated impacts of proposed actions to the current population trend. The best information currently available for monitoring trends in raven populations is data from the Breeding Bird Survey (BBS). The BBS is a large-scale inventory of North American birds coordinated by the U.S. Geological Survey, Patuxent Wildlife Research Center

(Sauer et al. 2014) that is comprised of a set of over 3,500 roadside survey routes primarily covering the continental United States and southern Canada. The effort was started in 1966 and routes are surveyed each June by experienced birders. The primary objective of the BBS is to generate an estimate of population change for songbirds. Populations of birds tend to fluctuate, especially locally, as a result of variable annual local habitat and climatic conditions. Estimates of population trends from BBS data are derived using a hierarchical statistical analysis (Link and Sauer 1994). The BBS analyzes bird population trends at the national, regional, State levels and for Bird Conservation Areas (based on physiographic characteristics). The breeding bird survey uses a 95% confidence interval as the credible interval for trend estimates.

BBS data will be used to monitor raven population trends, but it is also possible to use BBS data to develop a general estimate of the size of the raven population (Partners in Flight Science Committee (PIF) 2013). The PIF system involves extrapolating the number of birds in the 50 quarter-mile circles (total area/route = 10 mi^2) from the BBS survey to the area of the bird conservation regions in Idaho. Correction factors are applied to the resulting calculations to adjust for the biology of ravens and the environment in Idaho. The PIF system assumes a BBS detection radius of 0.25 miles for Idaho. The BBS surveys are conducted in the morning, but not all birds are equally visible in the morning. A time-of-day correction factor of 1.3 is applied to the raven estimate to adjust for daily patterns in raven activity.

Using BBS data to estimate the size of the raven population requires making some assumptions regarding the nature of the species in question and the data collection process. The first assumption is that chosen survey routes are totally random and are fully representative of Idaho habitats. Although routes are randomly picked throughout the State, the randomness of the selection is compromised somewhat because the survey routes are subsequently assigned to the nearest available road, which can be at some distance from the randomly selected survey location.

The second key assumption is that ravens are equally distributed throughout the survey area (i.e., Idaho). If survey routes included stops at raven congregation sites with excellent food availability, such as a landfill, or if ravens generally congregate near roads to scavenge road kill, then the data might be biased and would tend to overestimate the population. In the western U.S., ravens are known to scavenge along roadsides where automobile-killed animals can be found. If a BBS route is along a road that has heavy traffic and an abundance of vehicle-killed animals, more ravens would be expected to occur in the count area and, thus, the population might be overestimated. However, with the exception of a limited number of freeway and highway routes, the majority of Idaho's roads are not subject to heavy traffic and do not have an abundance of vehicle-killed animals. It would thus not be expected that the BBS counts would tend toward overestimating raven numbers due to the roadkill bias. In a California study by Kristin and Boarman (2003), proximity to roads was not a significant predictor of the number of ravens observed. However, based on Howe et al. (2014), ravens used transmission lines, including smaller low-voltage transmission lines. In areas where transmission lines run adjacent to roadways, there may be potential for overestimation of the raven population.

In Idaho, BBS data for the period of 1966-2012 indicate a statistically significant increasing trend for common raven populations in Idaho (3.4% per year), the Western Breeding Bird Survey Region (2.4% per year) and Nationwide (2.8% per year; Sauer et al. 2014). Idaho raven populations have also been evaluated at the local scale. Monitoring conducted on the grounds of the INL indicates that local populations have increased eleven-fold over the period of 1985-2009 (Howe et al. 2014). Partners in Flight Science Committee (2013) estimates the raven population in the U.S. at 1.7 million birds while the global population is estimated at 20 million and estimates Idaho's population at 50,000 birds (Partners in Flight Science Committee 2015).

In most areas ravens are a year-round resident, there is no evidence of migration from radio-tagged or marked populations in North America and Iceland (Boarman and Heinrich 1999); however, the species has been known to move into areas just outside its range during non-breeding season. Furthermore, there is some question as to whether some of the birds in flocks of floaters may be migrants (Boarman and Heinrich 1999).

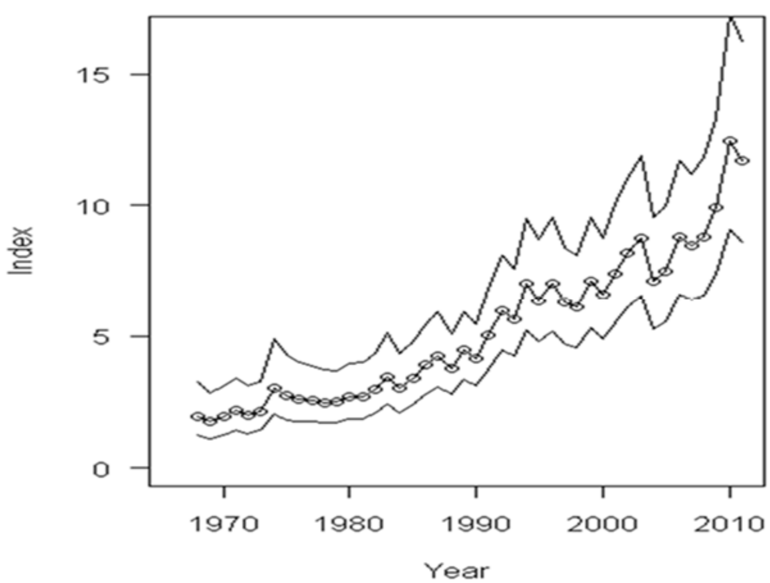

Figure 4.2. Annual population indexes and associated 2.7% and 97.5% credible intervals for ravens in Idaho. Indexes represent the mean count of birds on a typical BBS route in Idaho for each year (Sauer et al. 2014).

Raven nesting numbers are not precisely known over broad areas, and densities in Idaho probably vary throughout the State depending on the availability of food and water and the presence of human disturbance (Boarman and Heinrich 1999). Within Idaho, BBS data indicate that densities of ravens are less in the panhandle and extreme south central areas of Idaho (http://www.mbr-pwrc.usgs.gov/cgi-bin/...CqdW02C, accessed 6 March 2015) as compared to the remainder of the State. Knight and Call (1981) summarized a number of studies on raven territories and home ranges in the western U.S. Nesting territories ranged in size from one pair/3.62 mi^2 - 15.7 mi^2 in Wyoming and Oregon. In coastal California where an abundant food supply was available, raven nesting pair density was found to be 1 pair/1.7 mi^2 and 2.0 mi^2 (Linz et al. 1990, 1992). The densities in the Linz et al. (1990, 1992) studies were probably very high as a result of human food "subsidies" and were not representative of all of California. It is likely that Idaho also has sites with similar high nesting densities, although these sites are probably less common than in the more human-populated State of California. Based on nesting pair densities from studies in areas with similar BBS raven indices as Idaho, the raven territorial pair density in Idaho could be estimated to be at least 1 pair/3mi^2-6 mi^2 or about 13,926 - 27,852 (median = 20,889) territorial pairs.

Information on raven age-specific mortality rates and causes of mortality is limited. Current data from the Mojave Desert in California indicate 38% fledgling survival, 47% survival in the first year, 81% survival in the second year, 83% survival in the third year and 83% survival for adult birds (Webb et al. 2004). Bedrosian (2005) reports that juvenile ravens in the Grand Teton National Park had an 82.9% survival rate after departing from their natal territories. Some information on the longevity of ravens in the wild is available in banding records. The oldest known wild raven from band data was 22 years and seven months old (USGS 2016). However, ravens have been known to live much longer in captivity (Boarman and Heinrich 1999). Mortality factors for ravens are not well known and probably include predation (including nest predation by other ravens), weather-related factors, disease and human-induced mortality, such as shooting. Illegal shooting is not likely to be a major contributor to the cumulative mortality because ravens quickly learn to avoid humans with firearms after witnessing a fellow raven being shot.

Population Growth Model. For purposes of this analysis, the following equation was used to calculate the number of fledglings produced annually in the raven population.

$$F = (N) \times (Pb) \times (Fls)$$

Where F represents the number of fledglings produced per year, N is the number of nesting pairs, Pb is the probability of nest success and Fls is the average number of young fledged per successful nest.

The median number of territorial raven pairs (N) in Idaho estimated above is 20,889 territorial pairs in any one year. About 80% of territorial pairs will nest in a given year, which would yield an estimate of 17,711 nesting pairs in Idaho. Studies have shown a 58% to 100% nesting success rate (Pb) for ravens, with an average of 72.7% success (Boarman and Heinrich 1999). At the 72.7% average level, Idaho would have 12,876 productive nests per year. Average (± SD) clutch size reported by Boarman and Heinrich (1999) was 5.4 ± 0.42, but average fledgling success (Yf) was 2.5 ± 0.48 birds. Using the average nesting success rate (72.7%) and fledging success data (2.5) yield an estimate of 32,190 fledglings produced annually. Calculations using minimum values for nest success (58%) and fledgling success (2.5 – SD = 2.02) yield an estimate of 20,750 fledglings produced per year (Table 10). Likewise, calculations using maximum nest success (100%) and fledging success (2.98) yield an estimate of 52,779 fledglings produced per year. For purposes of a conservative analysis only estimates derived from low (20,750 = low) and average (32,190 = avg.) values will be used in subsequent discussions of population impacts.

Table 4.15. Estimated raven recruitment and annual mortality for Idaho using different assumptions.

	Low Nesting and Fledging Success	**Average Nesting and Fledging Success**	**High Nesting and Fledging Success**
ESTIMATE FOR STABLE POPULATION (no immigration)			
Pre-breeding Raven Population (Year 1)	50,000	50,000	50,000
Number of Territorial Pairs	20,889	20,889	20,889
Number of Nesting Pairs	17,711	17,711	17,711
Non-Breeding Bird (“floaters”)	8,222	8,222	8,222
% of Successful Nests	58%	72.7%	100%
Number of Young Fledged/Successful Nest	2.02	2.5	2.98
Total Fledglings (annual production)	20,750	32,190	52,779
(a) Total Population Post-Fledgling	70,750	82,190	102,679
ESTIMATE FOR POPULATION INCREASING at 3.4% PER YEAR			
(b) Raven Population Pre-Breeding (Year 2)	51,700	51,700	51,700
(c) Number of Ravens Lost to Mortality or emigration[1]	19,050	30,490	50,979

[1] (a) – (b) = (c).

The number of young ravens successfully fledged each year is the annual production. The annual production combined with the estimated pre-breeding population represents the post-fledgling population (Table 4.15). Using the estimates for low and average nesting and fledging success, post-fledging population estimates of 70,750 (low) and 82,190 (avg.) ravens, respectively, can be derived (Table 4.15). Assuming no immigration into the population, the estimated number of ravens produced is also the number of ravens (fledglings, sub-adults, and adults) that must either die or emigrate annually in a stable population (i.e. no growth or decline in raven density). The annual mortality (a composite of juvenile, sub-adult, and adult mortality/emigration) for ravens in Idaho, assuming a stable population, would be 27% (low) – 37% (avg.) of the post- fledging population density (Table 4.15).

Using the estimated pre-breeding raven population of 50,000 and an estimated 20,889 ravens in territorial pairs (i.e., 20,889 territorial pairs equals 41,778 birds), then 8,222 ravens would be non-breeders or "floaters." Floaters are primarily immature and non-breeding birds (i.e., fledgling, one and two year old birds). Ravens do not breed until they are three years old, though some unsuccessful attempts to nest have been documented for two-year old birds (Boarman and Heinrich 1999). The "floater" ravens tend to roam in loose-knit flocks that can number in the hundreds (Goodwin 1986). It is likely that these "free- floating" flocks are responsible for much of the raven-associated damage because these flocks tend to congregate at feedlots, landfills and calving and lambing grounds where food is abundant while the breeding birds tend to remain near their territories. WS-Idaho take, especially take associated with congregation sites such as calving grounds and landfills, would likely impact the floater segment of the raven population more than the less mobile territorial pairs. Boarman and Heinrick (1999) cite Sherman (1993) as reporting that nesting ravens in the Mojave Desert of California spent 75% of foraging time within 437 yards of the nest and cites Dorn (1972) that, in many areas, breeders probably remain near their territories throughout the year.

The majority of WS-Idaho's take of ravens has been the result of requests for the protection of livestock and the majority of ravens are taken by use of avicide (DRC-1339) treated egg-baits or meat-baits. These baits are placed in areas where ravens have been found depredating on or harassing newborn livestock, in areas where ground nesting birds are losing eggs or young to ravens, at sites where damage to agricultural or other resources is occurring and at landfills where raven foraging and accumulation of raven feces result in a number of nuisance and health and safety problems. The methodology used by WS-Idaho to place treated egg baits is described in Spencer (2002).

WS-Idaho's activities at human-generated food and water sources generally result in a reduction in the number of ravens present. This reduction is thought to be partially attributable to declines in the local population of ravens, but is also likely due to the removal of those birds with knowledge of the feeding site. Kristen and Boarman (2003) note that not all human related food and water sources are used by ravens and that ravens seem to learn about the location of food and water sources from other

ravens. Birds with knowledge of feeding sites tend to lead other birds to these sites. In a study by Webb (2001) fledgling chicks moved to human-related food sources which already had large flocks of ravens, even though similar food sources without raven activity were closer.
Removing birds with historical knowledge of the feeding site may reduce the incidence of new birds being attracted to the site.

WS employees monitor the raven numbers at baiting sites and then place an appropriate number of eggs needed to reduce the local raven numbers to the level needed to stop further damage from occurring. At the conclusion of the treatment period the WS employee collects the unconsumed eggs and disposes of them in accordance with label directions. DRC-1339, which causes death primarily due to kidney failure, is relatively slow-acting and birds do not die at the treatment site. This makes it necessary for the attending WS employee to estimate the number of ravens killed. WS employees use a combination of monitoring the number of ravens at a site before and after treatment, watching ravens during treatment and monitoring the number of eggs consumed to estimate the number of ravens killed. Each of these strategies has its strengths and weaknesses. The number of birds at a site may decrease for reasons not related to the use of DRC-1339 (e.g. a road kill carcass or spilled food attracts scavenging ravens), the amount of avicide needed for a lethal dose varies among individual ravens (each egg contains approximately 1.5 times the amount needed to kill half the birds tested (LD_{50})) and ravens may consume or cache more than one egg. The number of egg-baits taken per raven varies, ranging from about one to four. The National Wildlife Research Center using data and input provided by the WS-Nevada and several other western States conducted computer simulations of baiting efficacy for raven management using DRC-1339 egg baits. This analysis looked at several scenarios to account for differences in feeding behaviors at the bait site and the resulting dose consumed. The simulations used a bioenergetics model to predict the caloric requirement for corvids for any geographic location in the contiguous United States (Stahl et al. 2008). The development of the model is an effort to provide an alternative to estimate efficacy based on bird feeding behavior at the bait site and the resulting dose consumed. The researchers concluded that "simulations of baiting ravens with DRC-1339 provide an efficient means of estimating consumption of a lethal dose by a bird" (Stahl et al. 2008). Another variable that WS would like to incorporate into raven take estimates would be consumption of treated egg baits by non-target species, such as ground squirrels. Recent research conducted in Nevada using videography indicates that the traditional 1:2 ratio (ravens to missing eggs) used by managers to estimate raven take may result in substantial overestimation, especially if ground squirrels begin consuming egg baits (Coates et al. 2007). This research enforces WS' belief that it may be overestimating raven take. It is unlikely that the ground squirrels that consume the egg baits are affected by DRC-1339 as the LD_{50} for similar sized small mammals is very high. In fact, the amount needed to kill a fasted female albino rat (1170 mg/kg) is essentially more than would be placed out during an entire project. Conservatively, at the concentration that the DRC-1339 is used, a ground squirrel would have to consume 50 treated eggs at one sitting which is not physically possible.

Raven Population Impact Analysis. During FY 2011 to FY 2014, WS-Idaho's take of ravens during PDM activities averaged 107.5 birds (Table 4.16). Other types of known mortality include ravens killed resulting from WS-Idaho conducting Bird Damage Management (BDM) activities (n=34; USDA), ravens taken by IDFG for various wildlife management activities (n=3) and ravens killed through issuance of Depredation permits by the USFWS (n=36.75). Raven mortality from disease, natural death, collision with communication towers and buildings, tower and other structures and guide wires, electrical transmission lines, wind turbines/generators, aircraft, predation, weather, starvation, illegal shooting, etc. in Idaho is unknown and unavailable. However, the cumulative impacts of these factors are reflected in the overall population trend for the species. As noted above, BBS data show substantial increases in the state and regional raven population, which indicated that cumulative impacts of all current actions are not adversely impacting the raven population.

The four-year average known mortality of ravens in Idaho from all causes is estimated at 182.5 birds which represents only 0.36% of the population estimate of 50,000 and 0.88% of the minimum estimated post-fledging population (*n*=20,750). Under this alternative, future WS-Idaho annual raven take is not expected to be over 500 ravens, or 1% of the Idaho raven population. Using the maximum number of known ravens taken by sources other than WS-Idaho (*n*=41, Table 4.16) and the maximum number of ravens WS-Idaho would expect to kill in any one given year (*n*=500), the result would be the maximum annual cumulative take of approximately 541 ravens or <1.1% of the estimated population. Population trend data from the BBS is believed to provide the most accurate representation of the status of ravens in Idaho. Given a rate of population increase of 3.4% per year from 1966 to 2012 data and a raven population estimate of 50,000, a minimum of 1,700 ravens will be added to the Idaho population each year. Assuming that known cumulative human-caused raven mortality (Table 4.16) is additive to all other sources of mortality, raven take of 182.5 birds would be much less than the annual population increase from reproduction. If raven mortality is in some part compensatory to other forms of mortality (i.e. some of the ravens killed by WS-Idaho would have died anyway from other causes) then the raven population would continue to be increasing, but at a rate lower than the rate for Idaho. If cumulative take reaches the maximum of 541 ravens annually and all known human-caused raven mortality is additive to other sources of raven mortality, then take would still not result in a decreased population and the raven population would continue to increase at 2% annually. Mortality attributable to WS-Idaho is likely at least partially compensatory to other forms of mortality. WS-Idaho often takes ravens from flocks of "floaters" at raven congregation sites. Many of these birds are young birds without breeding territories. Data from Webb et al. (2004) indicates that first year birds have

Table 4.16. Population impact analysis of WS-Idaho's raven take and other raven mortality[1] in Idaho during 2011 to 2014.

Raven Mortality Information	2011	2012	2013	2014	4-Year Average[1a]
WS-Idaho's Take During PDM Activities[2]	31	160	180	59	107.5
Ravens Killed by WS-Idaho While Conducting BDM Activities[2]	60	30	26	20	34
Non-target, Unintentional Ravens Killed by WS-Idaho During Wildlife Damage Management Activities[3]	0	0	0	0	0
Projected Maximum Annual take by WS-Idaho	500	500	500	500	500
Ravens Killed by IDFG for Various Wildlife Management Actions[3]	0	0	0	12	3
Ravens Killed through Issuance of USFWS Depredation Permits[4]	106	19	10	12	36.75
Ravens Reported to IDFG as Roadkills[4a]	4	0	0	1	1.25
Total Statewide Mortality from all Known Causes	201	209	216	104	182.5
Projected Total Statewide Mortality if Maximum Take by WS	610	519	510	525	541 (2,291)[6]
Estimated Statewide Population[5]	50,000	50,000	50,000	50,000	50,000
WS-Idaho's PDM Take as % of Estimated Idaho Population	0.06%	0.32%	0.36%	0.12%	0.22%
Ravens Killed by WS-Idaho During BDM Activities as % of the Estimated Population	0.12%	0.06%	0.05%	0.04%	0.07%
Non-target, Unintentional Ravens Killed as % of Estimated Population	0%	0%	0%	0%	0%
Ravens Killed by IDFG as % of Estimated Idaho Population	0%	0%	0%	0.02%	0.006%
Ravens Killed Through Issuance of USFWS Permits as % of Estimated Idaho Population	0.21%	0.04%	0.02%	0.02%	0.072%
Road Kills as % of Estimated Idaho Population	0.008%	0%	0%	0.002%	0.002%
Cumulative Total Mortality as % of Estimated Idaho Population	0.40%	0.42%	0.43%	0.21%	0.36%
Projected Cumulative Take as % of Estimated Idaho Population if Maximum Take by WS	2.2%	2.0%	2.0%	2.1%	1.08% (4.58)[6]

[1] Raven mortality data only for WS-Idaho and other known and documented mortality events. Mortality from disease, natural death, collusion with towers, tower and other structures guide wires, and electrical transmission lines, wind generators, aircraft, automobiles, predation, weather, starvation, illegal shooting, etc. in Idaho is unknown and unavailable.

[1a] Numbers may not add up to 100% due to rounding.

[2] Includes ravens taken by WS-Idaho during PDM and BDM activities. Take based on federal fiscal year (October 1, to September 30, of each year). MIS (2011, 2012, 2013, 2014).

[3] A. Moser, IDFG, pers. comm. 2015. Take data is only available by State fiscal year (July 1, to June 30, of each year). IDFG did not conduct any raven management activities during 2011, 2012, or 2013.

4 Take data only available by calendar year.
4a DFG (2015*b*). Based on calendar year.
5 Partners in Flight Science Committee (2015).
6 In 2015, IDFG took 637 ravens for a sage-grouse protection study. The study is anticipated to run for at least 2 years with maximum annual take of 1,750 ravens and 250 raven eggs. Take estimate in parenthesis is maximum cumulative annual take if all IDFG take is the maximum number of birds allowed under the permit and IDFG take is 100% additive to WS-Idaho take.

much lower survival than older birds. In other wildlife populations with high mortality rates for young non-territorial individuals, human caused mortality is often compensatory to other forms of mortality and it seems likely that this would also be true for ravens. Therefore, if cumulative human-caused mortality is compensatory to even a small degree, i.e., to at least 3% of other sources of mortality, then the raven population would continue to increase annually. If WS-Idaho caused raven mortality is compensatory to a higher level of other raven mortality, then the population would be expected to continue to increase. Given this analysis and the research and monitoring, WS-Idaho concludes that this alternative will have a very low impact on the Idaho raven population.

Anticipated future actions: In 2014, ISDA issued a SLN registration allowing IDFG personnel to use DRC-1339 in certain situations and IDFG applied the product in a study to assess the impact of raven population reduction to protect sage-grouse in 2015. The IDFG reported taking 637 ravens in 2015, and the permit for the study allows for take of up to 1,750 ravens and destruction of up to 250 eggs. If WS-Idaho took the maximum number of ravens allowed under this alternative and the IDFG took the maximum number of ravens allowed under its permit, total raven take (2,291 - 4.58% of estimated raven population) would exceed the number of ravens currently added to the population each year given the current rate of raven population growth presented above. However, this level of take is highly improbable because take for the raven damage management study is anticipated to be at least partially compensatory to other damage management take by WS-Idaho and because take in 2015 is likely a more realistic reflection of total take likely in the project areas. Stable raven populations can sustain harvest through density dependent increases in reproduction by the remaining ravens (i.e., there are more resources for the remaining ravens so they can successfully produce more chicks), compensatory mortality (at least some ravens lost to PDM would have been lost to other causes), and immigration from surrounding areas. Data on sustainable harvest levels are not available for common ravens, but take above the current level of population increase would only be 1.18% of the population, a level which likely may be well within the sustainable harvest limits of the population. Even if local population reductions were to occur, given recent increases in the common raven population attributable to human-caused factors, the reductions are likely to only return the populations to levels more in keeping with what can be sustained by the native ecosystem and are unlikely to jeopardize the population. (See also analysis of Alternative 5 for full review of this same increase in raven take if take is conducted by WS-Idaho instead of IDFG).

Depending upon the season, some of the ravens in Idaho may be migrants, especially some of the birds in the large winter flocks (Boarman and Heinrich 1999). Therefore we are considering known raven mortality and trends in populations for states adjacent to Idaho (Montana, Nevada, Oregon, Utah, Washington and Wyoming) to evaluate direct effects and cumulative impacts. Table 4.17 provides data on mortalities of ravens for these States. There is a combined estimated population of 622,000 ravens (Partners in Flight Science Committee 2015) for the seven-State region with an average population increase of 3.3% per year, which adds 20,526 ravens to the population every year. The sum of the average annual number of ravens killed by WS programs in the seven-State region (*n*=7,212.5) and the average annual known mortalities (*n*=416.75) is 7,629.25, which represents 1.2% of the total estimated population and 37.2% of the annual reproduction. If all of these mortalities are additive, the resulting raven population would continue to increase by 1.9% annually, or 11,818 birds, indicating that WS' cumulative annual raven removal is having a very low impact on the seven-State raven population. Even if the maximum number of ravens noted above for WS-Idaho and IDFG were taken (1.6% of estimated population), total regional take would not exceed the current level of population increase. If these mortalities are partially or totally compensatory, then WS annual removal of 7,212.5 ravens is having very little to no impact on the seven-State population. Ravens killed would leave a temporary void in the general area where they were removed, but the areas would eventually be replaced by other ravens immigrating to that area and reproduction by the remaining birds.

Table 4.17. Estimated populations, percent of increase/decrease for ravens, and known raven mortality for 2011 to 2014 in Idaho and adjacent States. Population trend data is for the interval of FY 1966-2013.

State	Raven Population[1]	Population % ↑ or ↓[2]	Mortality Source	2011	2012	2013	2014	4-Year Average[3]
Idaho[4]	50,000	+3.4%	WS' Programs[5]	91	190	206	79	141.5
			Other Sources[6]	110	19	10	12	37.75
Montana[7]	60,000	+3.8%	WS' Programs	105	29	239	194	141.75
			Other Sources	27	50	42	13	33
Nevada[8]	190,000	+4.2%	WS' Programs	3,252	3,087	4,163	4,233	3,683.75
			Other Sources	27	118	83	0	57
Oregon[4]	90,000	+1.9%	WS' Programs	118	676	688	684	541.5
			Other Sources	266	69	291	NA	208.7[9]
Utah[7]	140,000	+2.5%	WS' Programs	1,564	2,124	2,011	2,056	1,938.75
			Other Sources	10	45	94	89	59.5
Washington[4]	52,000	+2.2%	WS' Programs	120	47	188	170	131.25
			Other Sources	25	6	165	NA	65.3[9]
Wyoming[7]	40,000	+5.4%	WS' Programs	331	506	807	892	634
			Other Sources	0	33	31	32	24
Total	622,000		WS' Programs	5,581	6,659	8,302	8,308	7,212.5
			Other Sources	465	340	716	146[10]	416.75[11]

[1] Population estimate (Partners in Flight Science Committee 2015).
[2] Percent increase or decrease per year (Sauer et al. 2014).
[3] Total may not add to 100% due to rounding.
[4] M. Lawrence, USFWS Region 1, pers. Comm. 2015.
[5] Includes all ravens killed including target and non-targets. Take based on federal fiscal year (October 1, to September 30, of each year).
[6] Total sum of raven mortality from USFWS migratory bird permits, reported killed by State natural resources agencies and other sources.
[7] K. Gonzales, USFWS Region 6, pers. comm. 2015
[8] J. Brown, USFWS, pers. comm. 2015.
[10] Three-year average is provided since 2014 data is not available.
[11] This total may be less than the actual amount because mortality for ravens in Oregon and Washington is not available for 2014.

The National Wildlife Research Center and the U.S. Geological Survey are cooperating to develop refinements to the PIF model used to determine raven population levels, to address concerns about some of its assumptions and to improve the precision of raven population estimates. As new information becomes available, WS-Idaho will apply new findings to this analysis to determine if any changes would trigger the need for additional NEPA compliance.

Crow Population Information. Crows are distributed north to south from the Yukon Territory, Canada, to Baja, California and Gulf of Mexico and are found from the west coast to the east coast (Johnston 1961). They can be found throughout the year in Idaho (Roberts 1992) and in both rural and urban environments. From their spring nesting colonies, or autumn and winter roosts, they forage for insects, grain and carrion. Like magpies and ravens, crows are omnivorous and eat a wide variety of foods and readily adapt to new food sources. In the Pacific Northwest there is little doubt that crows have adapted well to urban life, with many cities (i.e., Nampa, Caldwell, Boise, Twin Falls) supporting populations of crows. Johnson (1961) reports that crows reach their peak abundance in agricultural areas where there are wooded areas and have increased in numbers where agricultural practices have increased.

Crows use a variety of natural and human-altered habitat types including rangelands, riparian woodlands (Richards 1971), mixture of open field and woodlots (Johnson 1994), croplands, wetlands, fields, roadsides, pastures (Sullivan and Dinsmore 1992), beaches, shores of streams and lakes (Good 1952, Chamberlain-Auger et al. 1990), urban/suburban areas and golf courses (Chamberlain-Auger et al. 1990, Caffrey 1992). In general, crows thrive in areas of mixed habitat (open areas interspersed with woods) and thus, have responded well to human-altered habitats (Marzluff et al. 2001).

Crows normally nest in loose colonies, construct a bowl-shaped stick nest that is placed high in trees and lay four to six bluish-green to greenish buff eggs with brown spots (National Audubon Society 1977). Sub-adult offspring from the previous years' brood help at the nest with feeding the young and with territory defense (Stokes and Stokes 1996). From their spring nesting colonies or autumn and winter roosts, they forage for insects, grain, refuse and carrion.

American crow territories tend to be smaller in urban than in rural areas (Dickinson 1998) and are highly variable in size. Territory sizes range from 0.04 km^2 in suburban New York (Dickinson 1998) to 2.6 km^2 in a waterfowl breeding area of Manitoba (Sullivan and Dinsmore 1992). Caffrey (1992) reported an extremely high breeding density of 0.8 pairs/ha on a golf course in Encino, California. This density may be explained by the abundant food and suitable nest sites (trees) available at this site. Emlen (1942) also documented high densities (111 nests in 44 ha) of nesting crows in a walnut orchard in California. In addition, Caffrey (1992) reported territories overlapped extensively and were not defended against conspecifics in southern California. However, in Florida, Kilham (1985) reported aggressive territorial defense during the breeding season. These observations suggest significant flexibility in territory use and defense. This complex territorial behavior is influenced by a number of factors including food availability, time of year, and relatedness of individuals and mating system.

Crows are managed by the USFWS as migratory birds under the MBTA and by the IDFG as a game bird. Under the terms of an MOU with the USFWS, WS has the responsibility to respond to migratory bird damage complaints and provides USFWS with annual reports on activities involving migratory birds. Additionally, an MOU between the ISADCB and IDFG provides WS-Idaho authority to take protected wildlife (*e.g.,* game birds) in the State of Idaho.

Crows are managed by the State in Idaho through regulated hunting seasons, but are not counted by the State. This is because populations of these, as well as all other migratory birds, are managed by the USFWS who dictates to the States (all States, not only Idaho) what take from hunting will be allowed. Nationally, the Breeding Bird Survey data from 1966 to 2013 suggests that crow numbers were relatively stable in Idaho, Oregon, Utah, Washington and Wyoming, respectively, with populations increasing 5.19% per year in Nevada, Washington and the United States, respectively (Sauer et al. 2014). Crow populations are healthy enough and the problems they cause great enough that the USFWS has included crows in the same standing depredation order that was established for blackbirds, cowbirds, grackles, crows and magpies (50 CFR § 21.43). Under this regulation, no federal permit is required by anyone to take crows (or the other species of birds identified above) if they are committing or about to commit depredations upon ornamental or shade trees, agricultural crops, livestock or wildlife; or when concentrated in such numbers and manner that they are a health hazard or other nuisance. In addition, Idaho, along with most of the adjacent States, have a hunting season on crows with very liberal bag limits (Table 4.18).

Table 4.18. Status of crow hunting in States adjacent to, and including Idaho.

STATE	HUNTING SEASON	OPEN SEASON DATES	DAILY BAG LIMIT	POSSESSION LIMIT
Idaho	Yes, Statewide	Oct. 1 through Jan. 31 of each year (123 days)	No Limit	No Limit
Montana	No[1]			
Nevada	Yes, Statewide	Sept. 1 through Nov. 17 and Mar. 1 through Apr. 15 of each year (124 days)	10	10
Oregon	Yes, Statewide	Oct. 1 through Jan. 31 of each year (123 days)	No Limit	No Limit
Utah	Yes, Statewide[2]	Sept. 1 through Sept. 30 and Dec. 1 through Feb. 28 of each year (120 days)	10	30
Washington	Yes, Statewide	Oct. 1 through Jan. 31 of each year[2] (123 days)	No Limit	No Limit
Wyoming	Yes, Statewide	Nov. 1 through Feb. 28 of each year (120 days)	No Limit	No Limit

1 Montana does not have a regulated hunting season on crows, however, they are not protected by State law and can be killed without a State permit, certificate or license.
2 All national wildlife refuges in Utah are closed to crow hunting.

American Crow Population Impact Analysis. WS-Idaho has lethally removed an estimated average of 12.5 crows per year during the past four years (Table 4.19) while conducting wildlife damage management activities and WS-Idaho estimates that this number could increase to 500 annually depending on future crow damage and requests for assistance. The total amount of human- and non-human-related crow mortality is unknown, but the number of crows killed in Idaho from recreational hunters and crows removed through the USFWS Depredation Order (n=21.75 crows per year from 2011 to 2014) may account for several hundred crows annually.

Table 4.19. Population impact analysis of WS-Idaho's crow take and other known crow mortality[1] in Idaho during 2011 to 2014.

Crow Mortality Information	2011	2012	2013	2014	4-Year Average[1a]
WS-Idaho's Taken during PDM Activities[2]	0	0	0	0	0
Crows Killed by WS-Idaho While Conducting BDM Activities[2]	0	50	0	0	12.5
Non-target, Unintentional Crows Killed by WS-Idaho During Wildlife Damage Management Activities[3]	0	0	0	0	0
Projected Maximum Annual take by WS-Idaho	500	500	500	500	500
Crows Killed and Reported to the USFWS Migratory Bird Permitting Office[3]	1	50	36	0	21.75
Crows Reported to IDFG as Road kills[4]	0	0	0	0	0
Total Statewide Mortality from all Known Causes[3a]	1	100	36	0	34.25
Projected Total Statewide Mortality if Maximum Take by WS	501	550	536	500	522

Estimated Statewide Population[5]	120,000	120,000	120,000	120,000	120,000
WS-Idaho's PDM Take as % of Estimated Idaho Population	0%	0%	0%	0%	0%
Crows Killed by WS-Idaho During BDM Activities as % of the Estimated Population	0%	0.04%	0%	0%	0.01%
Non-target, Unintentional Crows Killed as % of Estimated Population	0%	0%	0%	0%	0%
Crows Killed and Reported to the USFWS as % of Estimated Idaho Population	0.0008%	0.04%	0.03%	0%	0.018%
Road Kills as % of Estimated Idaho Population	0%	0%	0%	0%	0%
Cumulative Total Mortality as % of Estimated Idaho Population	0.0008%	0.08%	0.03%	0%	0.03%
Projected Cumulative Take as % of Estimated Idaho Population if Maximum Take by WS	0.42%	0.46%	0.45%	0.42%	0.43%

[1] Crow mortality data only for WS-Idaho, private hunters and trappers and road kill reports submitted to IDFG. Mortality from disease, natural death, predation, starvation, private predator control, etc. in Idaho is unknown. There is a hunting season on crows in Idaho, but IDFG does not collect harvest numbers.
[1a] Numbers may not add up to 100% due to rounding.
[2] federal fiscal years – October 1 to September 30 of each year. MIS (2011, 2012, 2013, 2014).
[3] M. Lawrence, USFWS Region 1, pers. comm. 2015.
[4] IDFG (2015*b*). Based on calendar year.
[5] Partners in flight Science Committee (2015).

Because crows are relatively abundant in Idaho, WS-Idaho's removal of 500 crows annually would likely result in no more than a low magnitude of cumulative impact and jeopardize the viability of the State or regional American crow population because:

- crow population trend data from Idaho, surrounding States and in the United States indicate that populations are relatively stable and/or increasing (Sauer et al. 2014);
- crows are very prolific and directly benefit from human-caused environmental changes and agricultural developments;
- crows are highly mobile and have the capacity to quickly repopulate an area where local populations have been reduced; and,
- WS-Idaho operational control activities are conducted on relatively small geographic areas within the analysis area.

Black-billed Magpie Population Information. Like ravens and crows, magpies are omnivorous and very opportunistic in their feeding habits (Hall 1994). In Idaho, Gazda and Connelly (1993) confirmed that magpie predation was the single most important factor limiting waterfowl nesting success on their study area. Farmers growing alfalfa for seed in southern Idaho have also confirmed that magpies are a significant problem when they prey on valuable leaf-cutter bees. The bees are raised as pollinators for alfalfa seed crops and magpies can cause significant economic damage as they feed on the pupae emerging from the bee boards housed near the alfalfa fields.

The black-billed magpie is common throughout Idaho. Analysis of BBS data from 1966 to 2013, indicate high levels of annual variation in the population with no clear long-term population trend (Sauer et al. 2014). In neighboring States, magpie populations are relatively stable in Montana, Oregon, Washington and Wyoming, but decreasing in Utah (1.5% per year). Magpie populations are decreasing in the BBS Western region (0.5% per year; Sauer et al. 2014). Partners in Flight Science Committee (2015) estimate the magpie population in Idaho at 120,000 birds, assuming a statewide density of about
1.4 magpies per mi^2. However, Gazda and Connelly (1993) documented a nesting density of 35 active magpie nests per mi^2 on the Sterling Wildlife Management Area in southeastern Idaho, or about 70 magpies per mi^2, assuming two adult birds per nest.
Magpie populations are apparently healthy enough and the problems they cause are great enough that the USFWS has established a "standing depredation order" for magpies (50 CFR § 21.43). Under this regulation, no federal permit is required by anyone to take magpies if they are committing or about to commit depredations upon ornamental or shade trees, agricultural crops, livestock or wildlife; or when concentrated in such numbers and manner that they are a health hazard or other nuisance.

Black-billed Magpie Population Impact Analysis. During the past four years, WS-Idaho has lethally removed an estimated average of 33.75 magpies per year during PDM activities and 48.75 magpies per year while conducting BDM activities (Table 4.20) and WS-Idaho estimates that WS-Idaho take could increase to 200 annually depending on future magpie damage and requests for assistance. The total amount of human- and non-human- related magpie mortality from all causes is unknown, but the number of magpies in some years reportedly killed in Idaho annually through the USFWS Depredation Order (127 magpies per year from 2011 to 2014) could account for several hundred magpies.

Because magpies are abundant in Idaho, WS-Idaho's removal of several hundred magpies annually would likely result in no more than a low magnitude of impact and such impact would most likely be insubstantial to the magpie's overall viability and reproductive success.

Table 4.20. Population impact analysis of WS-Idaho's black-billed magpie take and other known black-billed magpie mortality[1] in Idaho during 2011 to 2014.

Black-billed Magpie Mortality Information	2011	2012	2013	2014	4-Year Average[1a]
WS-Idaho's Taken during PDM Activities[2]	0	40	0	95	33.75
Black-billed Magpies Killed by WS-Idaho while Conducting BDM Activities[2]	60	43	92	0	48.75
Non-target, Unintentional Black-billed Magpies Killed by WS-Idaho During Wildlife Damage Management Activities[3]	0	0	0	0	0
Projected Maximum Annual take by WS-Idaho	200	200	200	200	200
Black-billed Magpies Killed and Reported to the USFWS Migratory Bird Permitting Office[3]	25	83	400	0	127
Black-billed Magpies Reported to IDFG as Road Kills[4]	0	0	1	2	0.75
Total Statewide Mortality from all Known Causes	85	166	493	97	210.25
Projected Total Statewide Mortality if Maximum Take by WS	225	283	601	202	328
Estimated Statewide Population[5]	300,000	300,000	300,000	300,000	300,000
WS-Idaho's PDM Take as % of Estimated Idaho Population	0%	0.013%	0%	0.032%	0.011%
Black-billed Magpies Killed by WS-Idaho During BDM Activities as % of the Estimated Population	0.020%	0.014%	0.031%	0%	0.016%
Non-target, Unintentional Black-billed Magpies Killed as % of Estimated Population	0%	0%	0%	0%	0%
Black-billed Magpies Killed and Reported to the USFWS as % of Estimated Idaho Population[3a]	0.008%	0.028%	0.133%	0%	0.042%
Road Kills as % of Estimated Idaho Population	0%	0%	0.0003%	0.0007%	0.00025%
Cumulative Take as % of Estimated Idaho Population	0.03%	0.06%	0.16%	0.03%	0.07%
Projected Cumulative Take as % of Estimated Idaho Population if Maximum Take by WS	0.08%	0.9%	0.20%	0.07%	0.11%

[1] Black-billed magpie mortality data for WS-Idaho, mortality reported to the USFWS and road kill reports submitted to IDFG. Mortality from disease, natural death, predation, weather, starvation, control, etc. in Idaho is unknown.
[1a] Numbers may not add up to 100% due to rounding.
[2] Federal fiscal years – October 1 to September 30 of each year. MIS (2011, 2012, 2013, 2014).
[3] M. Lawrence, USFWS Region 1, pers. comm. 2015.
[4] IDFG (2015*b*).
[5] Based on Partners in Flight Science Committee (2015).

Bald and Golden Eagle Population Information. Conflicts with bald and golden eagles in Idaho are relatively uncommon. Rarely, a bald or golden eagle will predate on livestock (calves and lambs; Tables 1.4 and 1.5) or will present a bird strike hazard at airports. WS-Idaho responds to requests for assistance with technical and operational assistance with nonlethal methods. Methods may include use of frightening devices or, in rare situations, capture and relocation. WS-Idaho also provides guidance on animal husbandry and habitat management practices to reduce eagle attractants at sites where conflicts occur. A depredation permit from the USFWS Migratory Bird Permitting Office in Portland, Oregon, is required to capture and relocate golden and bald eagles that are causing livestock depredations or creating hazards to aircraft. Population trend information from the BBS for bald and golden eagles reflects the cumulative impact of all factors on eagle populations, including non-purposeful take resulting from human activities including collisions with vehicles, ingestion of lead ammunition used for hunting or PDM, habitat change and climate change. BBS population trend data for Idaho indicate a generally increasing trend for bald and golden eagles (Figure 1.1; Sauer et al. 2014). Population trends for the Western BBS Region indicate increasing trend for bald eagles (4.16% per year) over the period of 1966-2013 (Sauer et al. 2014), which is also consistent with the general conclusions of a recent USFWS review of the status of eagle populations in the U.S. (USFWS 2016c). Regional BBS population trend data indicate that golden eagle populations are relatively stable. USFWS long term population estimation indicate a stable or slightly increasing population (1%) per year for eagles in the coterminous western U.S. (USFWS 2016c). However, a demographic population projection model appears to indicate that the western golden eagle population may be trending in the long-term toward a lower equilibrium (approximately 26,000 eagles) from current trend of approximately 30,000 (USFWS 2016c). No more specific data is available for eagle populations within Idaho. The USFWS, the agency with management authority over eagles monitors their populations on a regional basis rather than on a State by State basis.

Bald and Golden Eagle Impact Analysis. Protective measures and potential risks from PDM actions are similar for bald and golden eagles. Although the bald eagle is no longer protected under the federal ESA, WS-Idaho continues to follow provisions for the protection of the bald eagle from former ESA consults with the USFWS (USFWS 1992, 1996*b*, 2002) because the bald eagle is still protected under the Bald and Golden Eagle Protection Act (BGEPA). These measures also work to reduce risks from PDM activities to golden eagles, which are also protected under the BGEPA. WS-Idaho adheres to the WS policies for use of foothold traps and snares including not using visible bait at trap or snare sets and that trap set sites (except traps used for mountain lions) will be no closer than 30 feet from a draw station. All animals shot on the ground by WS-Idaho using lead bullets within immediate vicinity of bald and golden eagles will be retrieved whenever possible and/or disposed of in a manner that renders them inaccessible to eagles. WS-Idaho will notify the appropriate USFWS office within 24 hours of the finding of any dead or injured bald or golden eagle. Cause of death, injury or illness, if known, will be reported to USFWS. WS-Idaho will monitor for and routinely remove carcasses or trapped animals resulting from PDM activities conducted in the immediate vicinity of active bald or golden eagle sites to prevent attracting eagles to the immediate area of ongoing PDM activities.

Despite WS-Idaho precautions, there continues to be a low level risk to non-target eagles from PDM activities. On January 6, 2013, WS-Idaho was contacted by two IDFG Conservation Officers (COs) who reported that a dead golden eagle was discovered in a foothold trap that was set to capture a mountain lion that was preying on domestic goats. The IDFG COs were assisting WS-Idaho with the mountain lion depredation control action by helping set the traps and by checking them periodically. The incident was verbally reported by WS-Idaho to the USFWS' Migratory Bird Permitting Office in Portland, Oregon and an incident summary statement was prepared and mailed to that same office. An internal informal investigation of the incident was conducted and the results indicate that the foothold traps were set appropriately and within WS policies. The IDFG COs took possession of the eagle carcass and shipped it to the National Eagle Repository of the USFWS. Two additional golden eagles were captured in snares and were released unharmed. Mitigation procedures were established with the USFWS in 2005 to prevent these types of non-purposeful captures. These are the only known instances of non-purposeful take of eagles by WS-Idaho. WS-Idaho expects that take of eagles will continue to be unlikely. WS and the USFWS at the national level are in the process of developing guidelines to issue "Non-purposeful" permits that would satisfy the Bald and Golden Eagle Act when non-target eagles are inadvertently killed from WS PDM activities. It is expected that these guidelines will be developed in the next one to two years.

The public has expressed concerns that eagles could be at risk of secondary toxicity from feeding on carcasses of ravens, magpies or crows that have died after consuming DRC-1339. Given information on DRC-1339 in Section 4.2.1.2, risk of secondary toxicity from DRC-1339 to predators and scavengers are low because DRC-1339 is rapidly metabolized by birds targeted during control operations and the toxicity rate is far higher for eagles than for that of the target species (i.e., application dosage is minimal for control of those birds while being relatively safe for non-target species).

According to records for the past eight years, WS-Idaho has applied approximately 1,300 DRC-1339 treated egg baits on 11 different projects and no non-target species have ever been known to have been exposed to, have consumed DRC-1339 treated eggs, have died from eating DRC-1339 treated eggs or have died from secondary poisoning. Nationwide, in the decades that WS has been using DRC-1339, there have been only two reports of secondary toxicity associated with this method. In one instance, a crow may have scavenged the gut contents of recently treated pigeon(s) (APHIS 2001). A second instance was reported in 1995 in which a peregrine falcon died from secondary poisoning after eating starlings near a DRC-1339-baited site (USFWS, BO 1995). Both applications involved the use of grain baits applied so that multiple starlings or pigeons could obtain a lethal dose of DRC-1339 bait at a single feeding station. The risks associated with these applications are not similar to the egg or meat bait formulation proposed for use under this EA. As applied for raven damage management, the amount of bait available to a raven in a single feeding is limited. The volume of material in an egg also reduces the likelihood that a raven would be able to consume the amount of DRC-1339 necessary to adversely affect an eagle in a single feeding. Consequently, given the scarcity of incidence of secondary toxicity nationwide from all applications of DRC-1339, the nature of the bait application proposed for this project and the relatively high LD_{50} for raptors and the single eagle trial, risks to eagles from the proposed use of DRC-1339 are negligible.

There are also concerns about the risks to eagles from consumption of carcasses of animals taken by WS that are killed with lead ammunition. (Stauber et al. 2010, Bedrosian et al. 2012, Haig et al. 2014). Much of the risk appears to be associated with eagles foraging on waterfowl that have ingested lead ammunition or fishing tackle or from foraging on offal piles (Bedrosian et al. 2012, Haig et al. 2014). However, Stauber et al. (2010), detected an increase in eagles at rehabilitation centers after the big game hunting season and hypothesized that the increase might have been associated with an increase in coyote hunting as hunters shifted from big game to coyotes at the end of hunting season although conclusive evidence documenting the increase in hunting was not provided. Multiple eagles and other scavengers can feed from single carcasses, and are at risk from ingesting lead fragments. WS-Idaho disposes of carcasses of animals taken with lead ammunition in a manner that reduces risks to scavengers when possible. However, for some methods, such as removal via aircraft, burial or off-site disposal is not a safe or practical option (See discussion in Section 4.2.1.2 about Effects on non-target animals from consumption of lead fragments). The majority of coyotes taken by WS are taken via use of shotguns from aircraft. Investigations by Hayes (1993) indicate that this type of use may have lower risks to eagles than some other types of ammunition:

- In studies that documented lead shot consumption by eagles based on examining the contents of regurgitated pellets, the shot was associated with waterfowl, upland game bird, or rabbit remains, and was smaller than shot-sizes used in aerial activities. Lead residues have been documented in jackrabbits, voles (*Microtus* spp.), and ground squirrels, which could explain how eagles could ingest lead from sources other than lead shot.

- Personnel of the APHIS-WS program examined nine coyotes shot with copper plated BB shot to determine the numbers of shot retained by the carcasses. In total, 59 shot pellets were recovered, averaging 6.5 pellets per coyote. Of the 59 recovered pellets, 84% were amassed just under the surface of the hide opposite the side of the coyote that the shot entered, many exhibited minute cracks of the copper plating, and two shot pellets were split. The fired shot were weighed and compared with unfired shot and were found to have retained 96% of their original weight. Eagles generally peel back the hide from carcasses to consume muscle tissue. Because most shot retained by coyotes tends to end up just under the hide, it would most likely be discarded with the hide. Any shot consumed would most likely still have the nontoxic copper plating largely intact, reducing the exposure of the lead to the digestive system. Those factors, combined with the usual behavior of regurgitation of ingested lead shot indicate a low potential for toxic absorption of lead from feeding on coyotes killed by aerial operations.

Nonetheless, although no known instances of eagle mortality from WS use of lead ammunition have been reported, it is possible. Even accounting for this possibility, however, as noted above, cumulative sources of mortality are not adversely affecting bald eagle populations, which are continuing to increase in Idaho and the western BBS region. Golden eagle populations appear to be stable to slightly decreasing. However, of known causes of anthropogenic mortality of golden eagles with satellite transmitters that were found dead, lead toxicosis was the least common form of eagle mortality (USFWS 2016*c*). Based on this information and the discussion below on lead impacts to non-target species, we conclude that WS-Idaho use of lead ammunition could result in the death of some eagles, but that this impact is low relative to other sources of lead poisoning, and it is not having a significant cumulative adverse impact on eagle populations. See discussion below on impacts to scavengers from lead ammunition for further details on WS use of lead ammunition and efforts to transition to lead-free ammunition.

There may also be concerns that WS' activities could result in the take or disturbance of eagles that may be near or within the vicinity of WS' activities. Under 50 CFR 22.3, the term "disturb", as it relates to take under the Bald and Golden Eagle Act, has been defined as "*to agitate or bother a Bald and Golden Eagle to a degree that causes, or is likely to cause, based on the best scientific information available, 1) injury to an eagle, 2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or 3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior*." With the exception of possible but unlikely WS-Idaho actions at airports to protect public health and safety from eagle activity on the airfield, activities that WS-Idaho conducts would not fall into the category that would require a permit for the non-purposeful take of bald eagles. The USFWS states that "Eagles are unlikely to be disturbed by routine use of roads, homes, or other facilities where such use was present before an eagle pair nesting in a given area. For instance, if eagles build a nest near your existing home, cabin, or place of business you do not need a permit." (USFWS 2012c). Therefore, activities that are species specific and are not of a duration and intensity that would result in disturbance as defined by the Bald and Golden Eagle Act would not result in non-purposeful take. Activities such as damage appraisals and trap checks are generally short term disturbances at sites where these take place.

WS-Idaho will conduct its activities that are located near active eagle nests and Important Eagle Use Areas using the National Bald Eagle Management Guidelines (USFWS 2007). The categories that would encompass most of these activities are Categories D (Off-road vehicle use), F (Non-motorized recreation and human entry), and H (Blasting and other loud, intermittent noises). These categories generally call for a buffer of 330-660 feet for categories D and F, and a ½ mile buffer for category H. Based on the above information and protective measures, WS-Idaho activities are not expected to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause a decrease in its productivity or nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior.

In conclusion, based on BBS population trend information and information presented above, the current WS-Idaho PDM program has not had an adverse individual or cumulative effect on bald eagle and golden eagle populations in Idaho or the Western BBS region. Future impacts under this alternative are anticipated to remain as stated above.

Other Predator Species Impacts. The other predator species that may cause occasional problems in Idaho are mink, long- and short-tailed weasels and spotted skunks. During the past four years (FY 2011 to FY 2014), WS-Idaho targeted and killed one mink, three spotted skunks and one weasel (species unspecified). All of these animals were taken during FY 2011. WS-Idaho receives periodic complaints involving these species and may conduct operational control in the future to take offending animals. Maximum annual take of these species would not exceed 5 mink, 5 spotted skunks or 3 weasels. Unless equipment is specifically set to capture them, the PDM methods used mostly by WS-Idaho exclude these species because of their size and weight. All of these species are found at moderate levels locally within their range in the State, based upon IDFG fur harvest and hunter take indices. During State FYs 2011, 2012 and 2013, fur trappers and hunters harvested 1,062, 22 and 267; 925, 59 and 208; and, 1,028, 78 and 293; mink, spotted skunks and weasels, respectively (IDFG 2011*a*, 2012*a*, 2014*b*). Even with minimal take by WS-Idaho, these species populations are highly unlikely to be cumulatively negatively affected by WS-Idaho PDM efforts and activities. Therefore, given IDFG oversight and the very low level of take by WS-Idaho with no take in most years, WS-Idaho take of mink, spotted skunks and weasels will not significantly impact populations of these species.

4.2.1.2 Alternative 1. Effects on Non-target Species Populations, Including T/E Species

DIRECT IMPACTS

Non-target Species Taken Unintentionally While Conducting PDM. Measures to reduce impacts to non-target species are built into Alternative 1 and the Proposed Alternative as standard operating procedures and were described in section 3.4.2.2. Those standard measures have helped ensure that non-target take in Idaho remains at relatively low levels. Non-target species taken in Idaho were recorded as unintentional target and non-target animals.

Known unintentional target and non-target animals[19] killed by WS-Idaho while conducting PDM activities during FY 2011 to FY 2014 are included in Table 4.21 below. Take included badgers (*n*=12), bobcat (*n*=1), domestic cattle (*n*=1), dogs (*n*=2), sheep (*n*=2), feral cats (*n*=2), dog (*n*=1), golden eagle (*n*=1), mountain lion (*n*=1), mule deer (*n*=7), porcupines (*n*=4), pronghorn antelope (*n*=1), raccoons (*n*=8), red fox (*n*=1), striped skunks (*n*=18), white-tailed deer (*n*=3), wild turkeys (*n*=3) and yellow-bellied marmots (*n*=2). On average, 17.75 non-target animals are taken per year in Idaho, with striped skunks being the most common, followed by badgers and raccoons.

Table 4.21. Non-target animals captured and killed or released by WS-Idaho while conducting PDM activities during FY 2011 to FY 2014 (Source: MIS 2011, 2012, 2013, 2014).

SPECIES	FY11		FY12		FY13		FY14		4-Year Average	
	Killed	Freed	Killed	Freed	Killed	Freed	Killed	Freed	Killed	Freed
Badger	2	0	3	7	5	3	1	0	2.75	2.50
Bobcat	0	2	0	0	1	0	0	0	0.25	0.50
Black Bear	0	0	0	2	0	0	0	0	-	0.50
Feral Cat	0	1	0	2	1	1	1	3	0.50	1.75
Feral Cattle	0	0	1	0	0	0	0	0	0.25	-
Feral Dog	0	0	0	5	0	3	1	1	0.25	2.25
Golden Eagle	0	0	0	0	1	0	0	0	0.25	-
Mountain Lion	0	0	1	0	0	0	0	0	0.25	-
Mule Deer	0	0	3	1	0	0	4	0	1.75	0.25
Pet or Livestock Guard Animal	0	0	0	0	0	0	2	1	0.50	0.25
Porcupine	1	0	1	0	0	1	2	1	1.00	0.50
Pronghorn Antelope	0	0	0	0	1	0	0	0	0.25	-
Raccoon	0	0	3	1	0	0	4	1	1.75	0.50
Red Fox	0	0	0	0	0	0	1	0	0.25	-
Sheep	0	0	0	0	0	0	2	0	0.50	-
Striped Skunk	4	0	5	0	5	0	4	0	4.50	-
Turkey Vulture	0	0	0	0	0	0	0	1	-	0.25
White-tailed Deer	0	0	1	1	0	0	2	1	0.75	0.25
Wild Turkey	1	0	0	0	1	0	1	0	0.75	-
Yellow-bellied Marmot	2	0	0	0	0	0	0	0	0.50	-
Total	10	3	18	19	15	8	25	8	17.00	9.50

[19] Unintentional target species: These are species that have been listed on the Work Initiation Document (WID) as target species to be controlled by WS-Idaho, but are taken unintentionally during efforts to take a different target species. Non-target species are not listed as target species on the WID and are taken unintentionally during efforts to take target species.

Non-target take was included in the population impacts analysis under 4.2.1.1 for badgers, bobcats, feral cats and dogs, mountain lions, raccoons, red foxes, striped skunks., feral cats, feral and free-ranging dogs, and eagles. WS-Idaho concluded that cumulative impacts to these populations, including the take of non-target animals, was not significant. As far as the other non-target species taken from FY 2011to FY 2014, no analyses are presented here for domestic cattle, dog, sheep, mule deer, porcupine, pronghorn antelope, white-tailed deer, wild turkey or yellow-bellied marmot population impacts because some are domestic animals and the others are common in Idaho and the minimal non-target take by WS-Idaho PDM is low enough to be intuitively insignificant to those populations. The average number of non-target animals killed per year by WS-Idaho while conducting PDM activities during FY 2011 to FY 2014 were relatively few compared to their overall populations in Idaho and impacts to these species would be considered negligible and impacts have been minimal. WS-Idaho's take of non-targets continues to be low and not consequential to any population.

The possibility exists that not all non-target animals taken by WS-Idaho are located, as some animals may consume bait and leave the site before dying (DRC-1339, LPCs), die after release from capture devices despite evidence indicating that they would survive after release, consume lead ammunition fragments when scavenging animals taken by WS-Idaho, or sustain injuries from devices without being captured in the device. Risks to non-target wildlife populations from DRC-1339 and lead ammunition, independent of the number of animals known to be taken, are addressed in detail in this section. Use of LPCs is exceedingly rare, and given the SOPs and label requirements for product use, storage and disposal; monitoring for carcasses and carcass disposal; and site cleanup unknown mortality of any non-target species from this method is negligible. Due to the fast-acting nature of sodium cyanide in the M-44 device, probability that an animals would receive a lethal dose and die out of range of detection by the specialist is low. Unknown take from other methods (i.e., injuries from capture devices) is likely to be low and less than the overall known take levels. Given the relative abundance of almost all the non-target species taken by WS-Idaho and the extremely low level of known take relative to species abundance, any unknown take is unlikely to result in an adverse cumulative impact on non-target species populations. Risks to relatively rare or threatened and endangered species are addressed in detail. Based on the available information, unknown take associated with the proposed action is not having an adverse impact or contributing substantively to cumulative impacts on non-target species populations.

Some commenters expressed concern regarding the impact of the proposed action on low-density forest carnivores such as pine marten (*Martes americana*) and fisher (*Martes pennanti*). A review of WS MIS records indicated WS-Idaho has never had unintentional take of pine marten or fisher and, therefore, the risks to these species from WS-Idaho activities is negligible. Similarly, review of WS MIS data for FY06-FY15 shows there are no records of marten or fisher take from surrounding similar WS programs in western states. See discussion of impacts to Canada lynx and wolverine below in section on impacts on T/E species.

Effects from use of DRC-1339. DRC-1339 treated eggs are registered for use in reducing depredation on newborn livestock and eggs and young of T/E species or wildlife designated to be in need of special protection from common ravens, American crows and black-billed magpies. The EPA label requirements for the use of meat baits stipulate that the baits be observed continuously from a distance of no more than 1,000 yards to detect approaches by T/E species and other non-target or protected animals likely to eat bait. Non-target animals approaching the baits are to be frightened away from the site. Due to this provision and others specific to non-egg baits, risks to non-target species from use of this formulation of DRC-1339 are extremely low and the analysis in this section will focus on risks associated with use of egg baits.

DRC-1339 is unique because of its relatively high toxicity to most pest birds but low-to-moderate toxicity to most raptors and almost no toxicity to mammals (DeCino et al. 1966, Schafer 1984, Schafer 1991). The LD_{50} is a standard notation for pesticides used to assess the relative toxicity of products and risks to human and animal health. It stands for lethal dose 50% which means that in a controlled experiment, the dosage of toxicant that is required to kill 50% of the animals exposed. Starlings, a species highly sensitive to DRC-1339, require a dose of only 0.3 mg/bird (3.8 mg/kg) to cause death (Royall et al. 1967). The LD_{50} value for ravens is 5.62 mg/kg (Schafer et al. 1983) and black-billed magpies is 5.6 to 17.7 mg/kg (DeCino et al. 1966). In contrast, Timm (1994) shows that the LD_{50} for bird species such as raptors (100 to over 500 mg/kg), sparrows (over 300 mg/kg), and eagles (over 100 mg/kg) classified as non-sensitive have much higher LD_{50}s. Timm (1994) further reports that the LD_{50} for American kestrel (*Falco sparverius*) and Cooper's hawk (*Accipiter cooperii*) are >320 mg/kg and 320-1,000 mg/kg, respectively. Eisemann et al. (2001) report that the LD_{50} for an African member of the Falconidae family (raptor) was >350 mg/kg and Schafer et al. (1983) report an LD_{50} for golden eagle at >100 mg/kg. Mouse and white rat LD_{50} values have been reported as 2,000 and 1,170-1,770 mg/kg, respectively (Hyngstrom et al 1994). Hyngstrom et al (1994) reports that the LD_{50} for domestic dogs, sheep and cows are >100 mg/kg, 400 mg/kg and >10 mg/kg, respectively. In order for a 30 pound (14 kg) dog, a 125 pound (68 kg) sheep, and 1,000 pound (454 kg) cow, to receive an LD_{50} dose of DRC-1339, they would need to consume the equivalent amount of DRC-1339 that would treat 700, 13,600, and 2,270 eggs (dosage of 2 mg/egg), respectively.

Prebaiting with untreated eggs is one technique used to reduce the exposure to non-target animals. Prebaiting is required by the DRC- 1339 pesticide label to 1) promote feeding by the target species (e.g., ravens and magpies), 2) facilitate monitoring target species' numbers, and 3) assess potential for exposure of non-target species. Non-treated, hard boiled chicken eggs are used for pre-baiting. To asses for terrestrial and nocturnal non-targets, such as coyotes, badgers, snakes, skunks, etc., the pre-baited site where untreated eggs are placed is thoroughly inspected for animal tracks or sign before and after the eggs are placed. If pre-baiting determines that non-target exposure is likely, then WS-Idaho will abandon that application site for placement of treated egg baits. If non-targets are attracted to the pre-baited eggs and there is evidence that the eggs have been pecked-on, consumed or been carried off, then that potential application site also will not be used. Eggs that are still in place after seven days will be removed, disposed of and that baiting site will most likely not be used for the remainder of that year's project. This approach will help reduce the potential of ravens caching eggs.

Coats et al. (2007) reports that videography used in the last two years of a four-year field study, documented that 14 DRC-1339 treated eggs were totally consumed by Wyoming ground squirrels, Piute ground squirrels consumed three treated eggs, great basin pocket mice consumed one treated egg and American magpies consumed two treated eggs. Domestic cattle consumed two untreated eggs. A total of 5,280 treated eggs were placed during this two-year period, but not all treatment sites were video recorded. It is important to note that videography did not capture any non-target species that are known to be at risk of fatality from DRC-1339 effects consuming egg baits (Coates et al. 2007). However, ground squirrels, which are not known to be vulnerable to the dosage of DRC-1339 injected into the eggs, were commonly observed consuming eggs. Ground squirrel LD_{50} value has not been described, but reported values of other rodents are relatively high (having a high tolerance). For example, mouse and white rat LD_{50} value was reported as 2,000 and 1,170-1,770 mg/kg, respectively (Hyngstrom et al 1994). LD_{50} value for ravens is 5.62 mg/kg (Schafer et al. 1983) and black-billed magpies is 5.6 to 17.7 mg/kg (DeCino et al. 1966), which means that mice and white rats (rodents) have a significant higher tolerance to DRC-1339. In evaluating the threat of DRC-1339 treated eggs to ground squirrels, the LD_{50} value for white rats (1,170 mg/kg) will be used for the comparison because they are similar in size and weight to a Wyoming ground squirrel (i.e., similar to that of the Idaho ground squirrels) as described in Coates et al. (2007) and because it is the lesser of the two rodent species and a more conservative value for this exercise. In order for an adult white rat, weighing 454 grams (1 pound), to receive an LD_{50} dosage, a single rat would have to eat 129 treated eggs. The average weight of a large, hard-boiled chicken egg is about 57 grams. A white rat would have to eat 7,353 grams or 16.2 pounds of eggs in order to receive an LD_{50} dosage of DRC-1339 and because DRC-1339 metabolizes very quickly, consuming this many eggs while still viable is biologically impossible. Besides, the number of treated eggs placed per square mile (640 acres) for the protection of sage-grouse and Columbian sharp-tailed grouse nests will most likely never exceed 14 at any one time. So in order for a one-pound white rat (or ground squirrel in this exercise) to receive an LD_{50} dose of DRC-1339, it would have to locate and eat all treated eggs placed in a nine square mile area which is impossible. In a Coates et al. (2007) study, the authors reported that the initial week of treatment following pre-baiting may have resulted in high raven take, but prolonged treatment did not appear to continue to remove ravens at high rates throughout the treatment period.

Birds in the corvid family, including the jays, crows, magpies and ravens are relatively sensitive to DRC-1339. Most birds in this family are known to prey on eggs of other birds although the extent to which they may use larger eggs such as the poultry eggs used to deliver DRC-1339 varies by species (Trost 1999, Balda 2002, Curry et al. 2002, Smith et al. 2013). Members of the corvid family which might occur in likely sage-grouse protection area include common raven, American crow, black-billed magpie, Western scrub jay (*Aphelocoma californica*) and piñon jay (*Gymnorhinus cyanocephalus*). Although crows, magpies and the jays listed above may occur in the project area, risks to these species from the use of DRC-1339 are anticipated to be low. Coates et al. (2007) reported that of the animals he video-recorded consuming treated and untreated egg baits (n=42), magpies were only recorded twice (4.8%) and videography did not capture any non-target species that are known to be at risk of fatality from DRC-1339 effects consuming egg baits. American crows are known to occasionally occur in the project areas, and black-billed magpies could be common in the project areas. The Idaho Bird Records Committee lists crows and magpies as common residents distributed throughout the State (Idaho Bird Records Committee 2014). Western scrub jay habitat includes scrub (oak, piñon (*Pinus edulis* and *P. monphylla*) and juniper) brush, chaparral, oak-pine associations, gardens orchards, and riparian woodlands (Curry et al. 2002). Piñon jays are most common in Piñon juniper woodlands, but may also breed in sagebrush, scrub oak and chaparral communities (Balda 2002). Scrub jays and piñon jays are listed as a resident species in the southeastern region of the state, but are only uncommon or locally abundant. In the southwest region, scrub jays and piñon jays are listed as being only occasional visitors (only 3-10 accepted records) during the winter and migration periods. Based on the information above, all of these species except crows and magpies are uncommon in the project area.

There are no instances of crow, magpie or jay predation on sage-grouse nests recorded in video monitoring conducted in Elko County Nevada from 2002-2005 or in the Virginia mountains of northwest Nevada from 2009 - 2011 (Coates et al. 2008, 2013) even though magpies and crows were specifically mentioned as occurring in the project areas. Assuming that corvids will respond to treated eggs in the same manner they respond to sage-grouse eggs, we anticipate minimal incidental take of American crows or black-billed magpies with the proposed use of DRC-1339. Additionally, in studies using videography at sage-grouse nests in Idaho and Nevada, crows and magpies and jays were not documented as nest predators (Coates et al. 2008, Lockyer et al. 2013).

Some birds such as crows and magpies are known to raid food caches of other birds and the possibility exists that these birds could access eggs treated with DRC-1339 that have been cached by ravens. Howe and Coates (2015) reported sage-grouse egg caching by ravens. Observations of ravens at landfills indicate that, when offered multiple eggs, ravens commonly consume at least one egg (often 2 eggs with a portion of a third) before attempting to move or cache other eggs (Spencer 2002, J. Spencer, WS-Nevada, Reno, NV, pers. comm.). In a study of greater sandhill crane (*Grus canadensis*) nest predation, common ravens consumed 67% of the eggs at the nest and cached the remaining 33% (Austin and Mitchell 2010). Sage-grouse commonly lay 5-8 eggs per clutch (Taylor et al. 2012). Based on observations above of the number of eggs eaten at landfill bait stations, a raven could eat sage-grouse eggs at the nest and still have eggs to cache. To help reduce risk of egg caching, WS-Idaho would only set one to two treated egg baits at each flat ground bait station, every seven days, as necessary. If during prebaiting, there is evidence that ravens are generally eating only one egg and caching the second, the number of eggs placed at each "set" can be reduced from two eggs to one. Additionally, each egg contains a lethal dose for a raven, so a raven that eats at least one egg only has a limited amount of time in which to locate and cache additional eggs which also helps to reduce the number of cached eggs available to non-target birds. Ravens hide cache sites from other species and have been known to conceal their caches with leaves, grass and dirt (Howe and Coates 2015). Risks are further reduced by the fact that DRC-1339 is only likely to remain viable in the moist environment of an egg for approximately a week. At dump or other sites where ravens are concentrated, only one to four eggs will be placed at a maximum of every seven days. Again, the number of eggs per "set" will be reduced if needed to reduce caching based on observations made during prebaiting observations. WS-Idaho will remain in close proximity of the dump site and observe using binoculars to determine if ravens are potentially caching eggs. If this is suspected, then only one to two treated eggs will be placed at each dump site to reduce the possibility of caching. This is the approach WS-Nevada has taken to minimize caching of eggs by ravens. (See also Section 4.2.5.2).

The use of elevated platforms may help reduce potential exposure to non-targets, such as snakes or small mammals. Heinrich (1988) reports that some ravens can be highly neophobic which could result in ravens rejecting egg baits on platforms. There is also some risk that platforms could serve as perching sites for species that prey on wildlife to be protected, and could exacerbate predation problems. It is not expected that elevated platforms will be used very often and if platforms are suspected as attracting other non-target species, such as raptors and non-target corvids, then the platform will be removed and use of it discontinued. The pesticide label also requires the applicator to observe the site for evidence of non-target activity before placement of treated egg baits. The observations will help determine flight patterns and paths and communal roost sites of ravens or magpies. Again, if non-target species are seen and the applicator determines that non-target exposure is likely, then that application site will not be used for placement of treated egg baits. Other procedures WS-Idaho will implement to minimize and avoid exposure to non-targets is by collecting unconsumed treated egg baits within no later than seven days after placement and by placing no more than two eggs at any one application site at any one time. This technique is recommended in Bentz et al. (2007) because it limits bait exposure on bait sites, thus reducing exposure to non-targets. Collected egg baits will be disposed of by burning or burial. Treated egg baits will only be placed at sites that ravens or magpies are actively using or where those birds are actually observed in the area.

It is highly unlikely that use of DRC-1339 would result in death of scavengers because of the product's relatively low toxicity to species that might scavenge birds killed by DRC-1339 and the tendency for DRC-1339 to be rapidly and almost completely metabolized in the target birds (Cunningham et al. 1979, Schafer 1984, Knittle et al. 1990). The excreted metabolites are non-toxic (Cunningham et al. 1979). Metabolism studies have shown that as much as 90% of a dose of DRC-1339 administered to birds is excreted in the form of parent compound or metabolite within 30 minutes (Apostolou 1969, Apostolou and Peoples 1971, Mull 1971, Giri et al. 1976). Goldade et al (2004) observed that when DRC-1339 was administered to dark-eyed junkos and red-winged blackbirds most of the radioactively marked DRC-1339 and metabolites had been excreted 4 hours after ingesting the bait (blackbirds - 85% excreted; junkos – 91% excreted). DeCino et al. (1966) fed a diet of starlings that had been killed with an estimated one to three lethal doses of DRC-1339 to a Cooper's hawk, a northern harrier and an American kestrel during a three- and four-month period. The Cooper's hawk consumed 222 starlings, the northern harrier consumed 191 starlings and the American kestrel consumed 60 starlings during the testing period. At the conclusion of the feeding trial, none of the raptors showed any ill effects and all gained weight. Cunningham et al. (1979) estimated that a sensitive species (i.e. cat, owl and magpies) could be at risk only if its diet consisted wholly of DRC-1339-poisoned starlings for more than 30 continuous days, which is highly improbable given the scope, duration, and density at which DRC-1339 baits would be used under this EA.

Secondary poisoning has not been observed with DRC-1339 treated egg baits. According to records for the past eight years, WS-Idaho has applied approximately 1,300 DRC-1339 treated egg baits on 11 different projects and no non-target species have ever been known to have been exposed to, have consumed DRC-1339 treated eggs, have died from eating DRC-1339 treated eggs or have died from secondary poisoning. Nationwide, in the decades that WS has been using DRC-1339, there have been only two reports of secondary toxicity associated with this method. In one instance, a crow may have scavenged the gut contents of a recently treated pigeon (APHIS 2001). A second instance was reported in 1995 in which a peregrine falcon died from secondary poisoning after eating starlings near a DRC-1339-baited site (USFWS, BO 1995). Both applications involved the use of grain baits applied so that multiple starlings or pigeons could obtain a lethal dose of DRC-1339 bait at a single feeding station. The risks associated with these applications are not similar to the egg or meat bait formulation proposed for use under this EA. As applied for sage-grouse protection, the amount of bait available to a raven in a single feeding is limited because only two eggs would be available in any given bait site and bait sites would be widely dispersed to reduce likelihood that raven would be able to access multiple baits. The volume of material in an egg also reduces the likelihood that a raven would be able to consume the amount of DRC-1339 necessary to adversely affect a raptor or most scavengers in one feeding prior to succumbing to the toxicant. Based on the above information, risks to non-target species from DRC-1339 are low.

DRC-1339 also degrades rapidly when exposed to moisture, sunlight, heat or UV radiation (Tawara et al. 1996). The useful life of DRC-1339 can vary between a couple of hours when under high humidity and sunlight to more than a week under dark, dry conditions (Bentz et al. 2007). The half-life of DRC-1339 in biologically active soil is about 25 hours and identified metabolites have low toxicity (Cunningham et al. 1997). Because DRC-1339 degrades rapidly in soils, does not persist and binds tightly to soils, it is unlikely that DRC-1339 is translocated into plants (APHIS 2001). Given that DRC-1339 is rapidly metabolized and does not persist in the environment, risks of bioaccumulation are negligible.

WS-Idaho completed Section 7 consultation in 2014 with the USFWS to assess the impacts of all DRC-1339 products, including treated egg baits, to grizzly bears, Selkirk Mountains woodland caribou, Canada lynx, North American wolverine and northern and southern Idaho ground squirrels and updated the consultation in 2016 (this consultation excluded the wolverine because it was temporarily delisted until just recently – see Section below on impacts to federally-listed T). A “no effect” determination was made by WS-Idaho for all species because; 1) the pesticide label prohibits its use in areas where the product may be consumed by endangered species, and, 2) mammals, in general, have a high tolerance to DRC-1339 (i.e., LD_{50} for white rats is 1,170-1,770 mg/kg. White rats were used in comparison with Idaho ground squirrel due to similar size and weight as described earlier in the study by Coates et al (2007). The USFWS informal consultation concurred with the conclusion that the Northern Idaho ground squirrel would not be at risk from DRC-1339 applications (USFWS 2016d). To provide additional protections for Idaho ground squirrels, WS-Idaho proposed to the USFWS that treated egg baits will not be placed within 500m of known southern Idaho ground squirrel colonies. This same restriction will also be applied to known colonies of northern Idaho ground squirrels.

In addition to secondary poisoning, some members of the public are concerned about tertiary poisoning from DRC-1339 (tertiary poisoning is defined as a scavenger/predator dying after eating a prey item that fed on the carcass of a bird that died from direct poisoning of DRC-1339). In addition to the explanations provided in the previous concerns, it is extremely unlikely that any effects would occur to an animal that would kill and consume or scavenge on an animal that fed on another animal that fed on an animal that ingested DRC-1339 or had died from secondary poisoning, simply because of the unlikelihood of secondary poisoning ever occurring.

Impacts on Wildlife Species Populations Caused by Low-level Flights during Aerial Shooting. WS-Idaho uses low-level fixed-wing aircraft and minimal use of helicopters to take target coyotes and ravens throughout much of Idaho. IDFG uses low-level fixed- wing airplane and helicopter flights routinely to census big game populations. A concern sometimes expressed is that aerial shooting might disturb other wildlife species populations and wild horses and burros to the point that their survival and reproduction might be adversely affected. Deer, wild horses, pronghorn antelope and other wildlife are occasionally seen during aerial shooting operations. However, WS-Idaho avoids horses and wildlife seen during aerial operations and presents little disturbance to them. Aerial shooting is an important method of taking primarily target coyotes in Idaho, especially in the spring when the majority of lambing and calving take place. WS-Idaho can use aerial shooting to control coyotes and other wildlife pursuant to the Fish and Wildlife Act (section 742j-1). Fixed-wing aircraft are the primary tool used for aerial shooting in Idaho, but a limited use of helicopters is employed in locations where the terrain is rough, heavily wooded, or mountainous.

In FY 2011 WS-Idaho flew 393.2 hours of fixed-wing airplane and 41.1 hours of helicopter; 620.4 hours of fixed-wing and 42 hours of helicopter in FY 2012; 496.2 hours of fixed-wing and 14.5 hours of helicopter in FY 2013; and during FY 2014, 427.5 hours of fixed-wing and 20.4 hours of helicopter, addressing PDM. WS-Idaho only conducts PDM activities on property under agreement. The yearly average of hours (n=513.83) flown by WS-Idaho from FY 2011 to FY 2014, 54.7% was on private lands, 28.2% on BLM lands, 14.9% on other lands (state, other federal public, military, county and tribal lands) and 2.2% on USFS lands. Though WS-Idaho does concentrate aerial shooting efforts during certain times of the year to specific places such as lambing or calving areas, this basically represents little time annually flown over properties. The number of acres for each land class (e.g., federal, State, etc.) where target predators were killed, the average amount of time spent on each of these lands was 0.89 min/mi^2 flying on private lands, 0.03 min/mi^2 for USFS lands, 0.65 min/mi^2 for BLM lands, and 0.93min/mi^2 [20] for other lands in during FY 2011 to FY 2014. Thus, the average amount of time during any given year that WS-Idaho conducts aerial shooting activities on any given land status is minimal. The effect is that relatively little time spent repeatedly on a small portion of property provides an extremely low ratio of time per square mile. Additionally, acreage flown or direct control performed during PDM by WS-Idaho is tracked by MIS through individual agreements. Therefore, even if an aerial crew, or WS employee, performed work on only 100 acres, the MIS will show it as flying/working the number of acres listed under that specific agreement, which could be and usually is considerably more (e.g. 5,000 acres).

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[20] Other lands include State, other federal public lands, military, county and tribal. These land classes equates to a relatively high flight time per mi^2 when compared with private, USFS and BLM lands due to the small parcel sizes.

A number of studies have looked at responses of various wildlife species to aircraft overflights. The National Park Service (NPS 1995) reviewed studies on the effects of aircraft overflights on wildlife. That report revealed that a number of studies have documented responses by certain wildlife species that suggest adverse impacts could occur. Few, if any studies, have proven that aircraft overflights cause significant adverse impacts on populations, although the report stated it is possible to draw the conclusion that impacts to wildlife populations are occurring. 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 involve areas near commercial airports and military flight training facilities. WS-Idaho aerial shooting operations occur in relatively remote rangeland areas where tree cover is at most scattered to allow for visibility of target animals from the air. In addition, WS-Idaho spends relatively little time over any one area.

Several examples of wildlife species that have been studied with regard to low-level flights are available in the literature. 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 were not adversely affected when exposed to flights ranging from 100 to 800 meters along, towards and from behind occupied cliff nests. Eagle courtship, nesting and fledging were not adversely affected, indicating that no special management restrictions were required in the study location.

Kushlan (1979) reported that 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. 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 flying military aircraft in North Carolina 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. Krausman et al. (1986) reported that only three of 70 observed responses of mule deer to small fixed-wing aircraft overflights at 150 to 500 feet above ground resulted in the deer changing habitats. These authors felt that the deer may have been accustomed to overflights because the study area was near an interstate highway which was followed frequently by aircraft.

Krausman and Hervert (1983) reported that, in 32 observations of the response of bighorn sheep to low-level flights by small fixed-wing aircraft, 60% resulted in no disturbance, 21% in "slight" disturbance, and 19% in "great" disturbance. Unlike this study, when WS-Idaho views wildlife, it avoids the area, whereas in this study, researchers made up to ten passes directly above the surveyed animal. When Krausman et al. (1986) 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 decibel 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 were found to decrease with increased exposure. Fancy (1982) reported that only two of 59 bison (*Bison bison*) groups showed any visible reaction to small fixed-wing aircraft flying at 200-500 feet above ground. The study indicated bison are relatively tolerant of aircraft overflights. Andersen et al. (1989) conducted low-level helicopter overflights directly at 35 red-tailed hawk (*Buteo jamaicensis*) nests and concluded that their observations supported the hypothesis that red-tailed hawks habituate to low level flights during the nesting period. Their results also showed similar nesting success between hawks subjected to such overflights and those that were not. White and Thurow (1985) did not evaluate the effects of aircraft overflights, but showed that ferruginous hawks (*B. regalis*) are 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 and neither were they alarmed when the researchers flew within 100 feet in a small fixed-wing aircraft (White and Thurow 1985). Aircraft overflights are likely to be separated from ferruginous hawk nests by no less than the 250 m described by Olendorff (1993) for reduction of risk of adverse impacts from brief disturbances. 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 and golden eagles were "incredibly tolerant" of overflights by military fighter jets and observed that, although birds frequently exhibited alarm, negative responses were brief and never limiting to productivity. Further reassuring, the considerable analyses of the Air National Guard (1997*a*, 1997*b*) show that, despite considerable research on numerous wildlife species, no scientific evidence exists that indicates any substantive adverse effects on wildlife populations will occur as a result of any of the types of low-level or other overflights that do or may occur.

A stated concern with WS-Idaho aerial shooting program is that it might disturb wild horses, especially during foaling. According to BLM, there are about 775 wild horses in Idaho and no known wild burro herds (BLM 2015*a*). The horses are located on six Herd Management Areas (HMAs), of which four HMAs are in the Boise BLM District, one in the Twin Falls BLM District and one in the BLM Challis Field Office. The overall capacity of the HMA to support wild horses is called Appropriate Management Level (AML). Wild horses have few natural predators and herd populations can double every five to six years. The BLM periodically gathers and removes wild horses to maintain each herd at its AML and especially to ensure horse and rangeland health.

Many of the areas inhabited by wild horses, or immediately adjacent to them, are also grazed by livestock in certain times of the year. In these grazing areas, WS-Idaho does conduct PDM. An expedient, efficient and selective PDM method is aerial shooting. Aerial shooting also allows minimal, if any, contact with sensitive desert terrain.

Because lambing and calving grounds are primary target areas for removal of depredating coyotes, WS-Idaho frequently flies in the vicinity of livestock with young. The aircraft activity has shown to produce little or no effect on sheep or cattle. Additionally, wild horses and wildlife species associated with the area inhabited by the livestock are also seen commonly. It is WS-Idaho's practice to avoid disturbing any non-target species encountered during the aerial shooting activities. Non-target animals displaying any signs of aversion to the aircraft are purposely avoided.

While wild horses and burros have been reported to become alarmed at the sight and sound of helicopter activity, especially in areas where helicopters are predominately used by BLM in round-ups, the small fixed-wing aircraft that are used by WS-Idaho have little notable effect on wild horses. Frequently the wild horses in the proximity of the hunt area are seen as ignoring the fixed-wing's aerial shooting activities, even to the point of not getting up from a reclining position. Because WS-Idaho is in active search of coyotes, which are significantly smaller than most wild horses, the presence of larger non-target species, such as wild horses, are quickly detected and avoided. During the foaling season of March 1 to June 30, when wild horses are detected and a disturbance is noted, the aircraft will respond by keeping a minimum of ½ mile distance away from them. It is possible that an inadvertent flyover may occur with a wild horse that has not been previously spotted during the aerial shooting activities. However, such events are uncommon. Such an encounter could possibly induce a flight response from the wild horse to the presence of the aircraft. WS-Idaho pilots respond quickly to such situations and remove the aircraft from causing any further effect on the animal by leaving the immediate area. These "disturbances" are accidental and of a singular nature and not persistent or repetitive and do not harass the animals.

WS-Idaho has actively used fixed-wing and occasionally rotor-wing aircraft for aerial shooting in areas inhabited by wildlife and wild horses for decades. No known problems to date have occurred nor are they anticipated in the future. Based on the above information and analysis, it is reasonable to conclude that WS-Idaho aerial shooting low-level flights should not cause any significant adverse impacts to non-target wildlife populations including raptors, big game and wild horses.

Effects of Human Activity on Wildlife. Some members of the public have expressed concerns that the mere presence of WS-Idaho personnel in the field during the spring months has the potential to cause harmful disturbance to wildlife and could potentially cause deer or antelope fawns to be separated from their mothers or might cause sage- grouse to abandon their lek sites. It has also been suggested that WS-Idaho personnel in the field could actually cause increased predation on sage-grouse or other bird species, because predators might see the birds as they flush from their nests (in response to human activity) and then go directly to the nest site to prey on eggs or chicks. MacIvor et al. (1990) specifically examined whether nest monitoring and other research activities influenced rates of red fox predation on both natural and artificial piping plover nests and concluded that even daily monitoring of nests was unlikely to result in any increased risk of predation. WS-Idaho employees rarely encounter sage-grouse or other bird species on their nests. But even if every nesting bird disturbed by a WS-Idaho employee actually abandoned its nest or had its nest destroyed by a predator, these encounters occur so rarely that they would be inconsequential in terms of impacts on local populations. Deer and antelope fawns are likewise rarely encountered during WS-Idaho activities and abandonment of fawns has never been documented in response to WS-Idaho or IDFG field activities.

Effects on Federally-listed Threatened or Endangered Species. During FY 2011 to FY 2014 there was no take of T/E species by WS-Idaho during PDM actions, with the exception of the intentional take of one grizzly bear as authorized by the USFWS (See grizzly bear section of target species impact analysis above). WS-Idaho consults with USFWS on its program's potential effects on T/E species from PDM activities including completion of a new informal and formal Section 7 consultation, resulting in a Biological Opinion issued by the USFWS on all WS-Idaho activities and methods used completed in 2016 (USFWS 2016d, USDA 2016). No action occurs without either; 1) a determination that the program would have no effect on T/E species, 2) a concurrence from USFWS that the program would not be likely to adversely affect T/E species, or, 3) a USFWS formal Biological Opinion with reasonable and prudent measures, if necessary, to ensure that WS-Idaho would not jeopardize the continued existence of T/E species in Idaho.

The methods that WS-Idaho might implement under this alternative (Appendix B) would not result in substantial disturbance or destruction of habitat and would not be conducted in aquatic habits. There is no risk of capturing or injuring an insect or an aquatic organism with any device used in PDM by WS-Idaho. All pesticides use will follow label instructions to prevent any impacts to aquatic environments, including ground water. As noted in the section on indirect impacts below, intensive and lasting large-scale reductions or elimination of apex predators has been documented to impact physical characteristics of the environment including soil compaction and stream morphology (Beschta and Ripple 2006, Beschta et al. 2008, Naiman and Rogers 1997). However, the proposed PDM activities are not anticipated to result in local predator population reductions of sufficient magnitude, duration or scope to result in adverse indirect impacts on trophic cascades and terrestrial and aquatic habitats. Therefore, WS-Idaho has determined that it's use of PDM methods under this alternative will have no effect on federally-listed insects, plants or aquatic organisms, including; Banbury Spring limpet (*Lanx* sp.), Bliss Rapids snail (*Talorconcha serpenticola*), Snake River physa snail (*Haitia* (*Physa*) *natricinia*), Bruneau Hot Springsnail (*Pyrgolopsis bruneaunsis*), Snake River Sockeye Salmon (*Oncorhynchus nerka*), Snake River Spring/Summer and Fall Chinook (*O. tshawytscha*), Snake River Basin Steelhead (*O. mykiss gairdneri*), Kootenai River white sturgeon (*Acipenser transmontanus*), Macfarlane's four-o'clock (*Mirabilis macfarlanei*), slickspot peppergrass (*Lepidium papilliferum*), Spalding's catchfly (*Silene spaldingii*), Ute Ladies-tresses (*Spiranthese diluvialis*) and Water howellia (*Howellia aquatalis*), and Whitebark Pine (*Pinus albicaulis*) (Appendix F).

The 2016 Biological Opinion concurred with WS-Idaho's determination that PDM methods proposed in this EA may affect but are unlikely to adversely affect yellow-billed cuckoo, Selkirk Mountain woodland caribou, and Northern Idaho Ground Squirrel (USDA 2016, USFWS 2016d). PDM actions are conducted at the request and directly under the supervision of the USFWS for the protection of Northern Idaho Ground Squirrel (Section 1.2.3). Potential impacts to yellow-billed cuckoo are limited to rare and short-term disturbance as personnel and aircraft move through or near areas used by cuckoos and from noise associated with PDM activities. Conservation measures for the protection of yellow-billed cuckoo include minimizing PDM activities in yellow-billed cuckoo breeding habitat during the breeding season. Outside known breeding habitat, WS-Idaho will also discontinue use of frightening devices if cuckoos are observed in or near the project area.

Risks to Selkirk Mountain woodland caribou from PDM primarily involve risk of unintentional capture in neck/body snares. In the Southern Mountain Caribou Recovery Zone, WS-Idaho will give preference to shooting for mountain lion damage management because risks to the caribou are eliminated by confirmation of target prior to shooting. Use of neck/body snares will be restricted to between December 1 and March 15, to areas below 4,500 feet in elevation, and devices will be checked at least daily. Prior to using neck/body snares outside the date and elevation restriction identified above, WS-Idaho will coordinate with the Panhandle IDFG Regional Wildlife Manager and the USFWS to inquire if the area is occupied by Selkirk Mountain woodland caribou. If the area is occupied by these caribou, WS-Idaho will not use neck/body snares. If the area is determined not to be occupied, WS-Idaho will still conduct site-specific extensive and intensive[21] surveys on the proposed property prior to setting neck/body snares.

The 2016 Biological Opinion concluded that some of the proposed PDM methods may affect Canada lynx. WS-Idaho has only had one unintentional take of a Canada lynx in 40 years. The animal was captured in 1991 with a foothold trap and was released on-site. Disturbance associated with aerial shooting, ground shooting, frightening devices, trained dogs, and site access were identified as having the potential to result in short-term displacement of Canada lynx to more secure areas. However, the USFWS determined that this disturbance would be temporary and of low intensity and would not pose a significant risk to Canada lynx. The possibility exists that tracking dogs could follow a lynx. If it is determined that a tracking dog is following a lynx, the lynx is expected to find shelter in tress and would be safe until the tracking dog could be removed. Once the dog is removed, the lynx could resume its natural behavior. The USFWS determined that this short-term disturbance would not pose a significant risk to Canada lynx.

Methods which were identified in the Section 7 consultation as posing a risk of unintentionally capturing, injuring or killing Canada lynx were culvert and cage traps, foothold traps, and snares. When using culvert or cage traps, foothold traps or snares in known lynx habitat, WS-Idaho will not use any olfactory attractants containing fish oil, catnip, anise or castor oil as ingredients and will not use baits likely to be attractive to Canada lynx or other felids to reduce likelihood of attracting lynx. Foot snares and foothold traps used in known lynx habitat will have pan tension adjustments such that it would require 8-10 pounds of pressure to trigger any device set to capture larger predators. Measures employed to reduce risks to grizzly bears and Selkirk Mountain woodland caribou will also reduce risks to lynx. For example WS-Idaho will not use neck snares in areas above 4,500 ft. in elevation in areas which may be used by Selkirk Mountain woodland caribou. In Idaho, most lynx habitat occurs above 5,000 ft. Similarly, restricting the use of neck snares to December 1-March 15 (season when grizzly bears are in dens) also helps reduce risks to lynx that could be using the same habitat.

The USFWS 2016 Biological Opinion concluded that all WS-Idaho activities combined (not just PDM) could result in the incidental take of 2 Canada lynx over a 40 year period with only one of the lynx to die from the use of snares or traps. Furthermore, the estimated loss of no more than 1 lynx over this time interval would

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[21] Extensive surveys will cover the area within a 3 mile radius (28.27 mi^2) of a proposed location where a wildlife damage management method will be used and will consist of driving dirt roads; inspecting accessible snow machine trails and walking trails, as necessary; using telemetry equipment when applicable; and visiting with landowners and natural resource personnel, as appropriate, to search for any sign of the species of interest. Intensive surveys will consist of thoroughly searching the immediate area (0.25 mi^2) surrounding the proposed location where a wildlife damage management method will be used, to search for sign or other evidence of the species of interest.

have a relatively minor impact on the overall lynx population and would not result in an appreciable direct, indirect or cumulative reduction in the likelihood of the survival or recovery of lynx

Consultation with the USFWS (USFWS 2016d) also indicates that use of the methods proposed under this alternative may affect grizzly bears. Methods identified as potentially posing risks to grizzly bears were culvert and large cage traps, foothold traps, snares, LPCs, M-44s, aerial shooting, aerial telemetry, ground shooting, frightening devices, electric/temporary fences, trained dogs and site access. Potential impacts of disturbance associated with use of aircraft, shooting, frightening devices, tracking dogs and site access were similar to those described above for lynx and were determined to be insignificant. To the extent that use of frightening devices also deters grizzly bears from preying on livestock and reduces the likelihood of management removals, they may also have limited beneficial effects. Similarly, impacts of electric/temporary fencing produce a mild electric shock that provides no lasting effects on the bear and reduces the likelihood of management removals.

WS-Idaho rarely uses LPCs and, in accordance with label requirements, would not use LPCs in occupied grizzly bear habitat. Risks outside occupied grizzly bear habitat are further reduced because grizzly bears do not kill by biting the throat of the animals, and generally do not feed on the area around the neck. Consequently, the USFWS determined risks from LPCs to grizzly bears were discountable. M-44s are not used in areas occupied by grizzly bears from March 1 to November 30 and no grizzly bears have been killed by M-44s. Additionally, WS-Idaho has decided not to use M-44s on public lands which is where most grizzly bears occur. Therefore, risks to grizzly bears from these methods was deemed to be discountable.

WS operations in Idaho, Wyoming and Montana have never captured, held or had a grizzly bear escape from foothold traps set for coyote, bobcat, red fox and similar-sized animals. Grizzly bear populations in northern Idaho are not recovering in the same manner as grizzly bears in the GYA. Therefore, despite the extremely low level of risk, in northern Idaho (areas north of the Clark Fork River, Lake Pend Oreille and Pend Oreille River) additional precautions have been established to reduce risk of take. In these areas, WS-Idaho will perform daily checks of foothold traps set for coyotes, bobcats, red foxes or similar-sized animals from March 15 to December 1. WS-Idaho has never captured grizzly bears in larger foothold traps set for mountain lions or wolves, but such take has occurred in other states (6 incidents in the last 20 years). Statewide, foothold traps used to capture mountain lions in occupied grizzly bear habitat from March 16 to November 30 will be checked at 24 hour intervals and will be anchored sufficiently to hold an adult bear. If an adult bear is captured, the anchoring system should be sufficient that the bear will be able to pull its foot free of the trap or hold the animal in place so it can be checked and released and will ensure that the bear cannot leave with a trap fastened to its foot.

Foothold traps will only be used in these areas when other capture methods are impractical or ineffective.

WS-Idaho has never captured a grizzly bear in a foot snare but, during the last 20 years, one bear was captured and released by WS in Wyoming. Similar to foothold traps, foot snares set in occupied grizzly bear habitat from March 16 through November 30 will be checked at 24-hour intervals, use ¼ inch steel cable and be equipped with swivels, and will be anchored sufficiently to hold an adult grizzly bear. Nationwide, WS has only caught one grizzly bear in a neck/body snare in the last 20 years (one bear killed in Wyoming). To avoid risks, WS-Idaho will not set neck/body snares in occupied grizzly bear habitat from March 16 through November 30.

The USFWS Biological Opinion (USFWS 2016d) issued to WS-Idaho includes an "incidental take statement" stating that a maximum of three grizzly bears may be taken in any 20 year period due to all WS-Idaho activities combined (not just PDM); however, only one grizzly bear may be fatally taken during any 20 year period and lethal take is only expected to possibly occur in the GYA. In the professional opinion of USFWS grizzly bear biologists, that level of take is not likely to jeopardize the continued existence and recovery of the grizzly bear (USFWS 2016d).

In August 2014, USFWS determined that listing of wolverine under the ESA was not warranted. This decision was overturned by a federal court decision in April 2016 (Defenders of Wildlife v. Jewell, Case No. 14-246-M-DLC (D. Mont. Apr. 4, 2016)). WS-Idaho re-initiated consultation with the USFWS to address potential risks to wolverine in 2016 which reviewed consideration of wolverine in the 2014 BO conducted where wolverine were a species proposed for listing under the ESA. No wolverine have been taken during activities to manage the species listed in this EA, but, over the 10 year period prior to 2014, three wolverine were unintentionally captured by WS-Idaho in foothold traps set to capture wolves. Two of the wolverine were released on site and the third was euthanized because it was determined that it would not survive if released. All three wolverine were captured in a localized area on the Payette National Forest. WS-Idaho has implemented several preventive measures in this area from the 2014 consultation with the USFWS, including placing traps away from carcasses, not using musky or castor-based lures and, prior to placing predator capture equipment, conducting a site investigation to check for sign of wolverine presence. If site investigations indicate the area is actively in use by wolverine, other PDM methods will be used. In the 2014 Biological Opinion, USFWS determined WS-Idaho's actions are not anticipated to result in the take for more than 4 wolverine in a 10 year period (impact of all WS-Idaho wildlife damage management actions combined), only two of which may die from WS activities although the likelihood of mortality is low. The USFWS concluded that this level of take would not appreciably reduce the likelihood of both the survival and recovery of the wolverine. If the current consultation indicates there may be impacts to wolverine from WS-Idaho's activities greater than or substantially different from those addressed herein, WS will revise this EA in accordance with APHIS NEPA implementing procedures.

Idaho State Listed Threatened or Endangered Species (T/E). Idaho Administrative Code defines an endangered species as any native species in danger of extinction throughout all or a significant portion of its Idaho range and a threatened species as any native species likely to be classified as endangered within the foreseeable future throughout all or a significant portion of its Idaho range (IDAPA 13.01.06.150.01). All species that are listed under the ESA are automatically listed as Idaho State T/E. However there are some additionally species which are State T/E, but not federally listed. Those species are the ling burbot (*Lota lota*) and pacific lamprey (*Lampetra tridentate*) (IDAPA 13.01.06.150.02). These two fish species are found in northern Idaho; however, WS-Idaho's PDM activities and control methods and techniques will have no effect on the populations of these species because the control methods and techniques which are used in PDM are not placed in aquatic environments or habitat used by these species.

Sensitive Species Designated by Federal Land Management Agencies or Tribes. Tribes and federal land management agencies may establish their own lists of sensitive species which warrant special management consideration. WS-Idaho consultation with these entities during development of annual work plans, MOUs and agreements for control include discussions of special management actions required to reduce risk of adverse impact on sensitive species. Given the impact analysis above for all non-target species, the proposed action is unlikely to have an adverse direct, indirect or cumulative impacts on these species populations as a result of inadvertent injury or mortality caused by WS-Idaho. Consultations help to identify areas and situations which may be adversely impacted by disturbance and identify ways in which these risks may also be minimized including consideration of guidance documents such as BLM Information Bulletin 2010- 039 that describes disturbance buffers and other measures for protection of various species.

INDIRECT IMPACTS

Effects on non-target animals from consumption of lead fragments. Agencies and members of the public have expressed concerns regarding the potential for adverse environmental impacts and risks to human health and safety from the materials used in ammunition. The majority of concerns expressed pertain to the use of lead ammunition and this section correspondingly focuses on risks associated with lead (e.g., Watson et al. 2009). However, it should be noted that some of the non-lead materials used in ammunition and lead-free ammunition (arsenic, nickel, copper, zinc, tungsten) are also known to pose environmental risks (EPA 2016, Clausen and Korte 2009, Beyer et al. 2004, Eisler 1998). Exposure and risk to non-target animals would be greatest for wild and domestic animals that consume carcasses containing lead ammunition from PDM actions including bald and golden eagles (Stauber et al. 2010, Bedrosian et al. 2012 and Haig et al. 2014). There is also the potential for lead exposure to non-target mammals and birds from consumption of lead bullet fragments in the soil. The potential for lead exposure and risk to these types of scavengers would be reduced in situations where carcasses are removed or otherwise rendered inaccessible to scavengers through burial or state, territory, or tribally-approved carcass disposal practices. Lead exposure and risk would also be further reduced in cases where the use of lead-free shot can be effectively, safely, and humanely used to remove feral swine.

For all programs, WS uses lead-free ammunition when practical, effective, and available to mitigate and/or minimize the effects of its use of lead ammunition on the environment, wildlife, and public health and in compliance with federal, state, territory or tribal regulations on the use of lead ammunition. WS does not use lead ammunition in areas where it is prohibited by law or where prohibited by the landowner/manager (e.g., National Park Service). WS uses lead-free shot to remove ravens, magpies and crows and for other MBTA permitted activities, including activities in waterfowl production and wintering areas.

The WS program has specific ammunition and firearm requirements to maximize performance, safety and humaneness similar to those for other wildlife damage management applications (Caudell et al. 2012). Precision performance of bullets is essential for project efficacy, safety, humaneness (shot placement to result in rapid death) (McPhearson 2005, Caudell et al. 2009), and shot placement to preserve tissues for animal health monitoring. Direction of ricochet/ pass-through is difficult to predict (Burke and Rowe 1992) and is a safety concern especially at airports, in areas near residences, areas with rocky substrate, and for WS-Idaho personnel in aerial shooting teams. Ammunition which conveys its full energy to the target animal and which results in low or no pass through is needed for reasons of humaneness (instant or near-instant incapacitation) and to reduce safety risks associated with wounded animals.

Current challenges associated with lead-free ammunition include that some types of lead-free ammunition are harder than lead ammunition and more likely to ricochet off hard surfaces, increasing the odds of hitting aircraft, personnel, or other unintended targets and presenting unacceptable risks to human safety (APHIS 2012). WS has also tested bismuth ammunition for aerial operations but found the product too frangible for safe and effective use. Increased wounding has been associated with lighter bullets (Aebischer et al. 2014). Lead-free alloys require longer bullets to obtain comparable bullet weights. Terminal performance (the performance of the bullet upon striking the target animal) is, in part, determined by bullet weight. Ballistically, a faster rate of twist is usually necessary to stabilize longer bullets, though individual firearm performance varies. In some calibers (i.e., .22 rimfire and centerfire), accuracy of non-lead ammunition is less than accuracy of lead ammunition in many of the firearms presently in use by WS-Idaho. While non-lead ammunition is available in many calibers, their suitability and accuracy in all firearms is not universally equal to lead ammunition. Harder lead-free rifle ammunition is more likely to result in "non-frangible bullet pass-through," and failure of the bullet to convey its full energy to the target animal, although similar problems also exist with some types of lead rifle ammunition. In addition to the increased risk of hitting an unintended target, non-frangible bullet pass-through also increases the likelihood that the target animal may not be rapidly or instantly killed by the shot and may be considered less humane (APHIS 2012). WS-Idaho evaluates new lead-free ammunition alternatives as they become available.

Lead-free ammunition is often more expensive than equivalent ammunition using lead. Although, the cost of management may sometimes be secondary because of overriding environmental, legal, human health and safety, animal welfare, or other concerns, it is still an issue. Cooperators usually pay a substantial portion of operational program costs, and may be unwilling to pay the additional ammunition costs in areas where it is otherwise legal to use lead ammunition.

WS aims to use the fewest number of shots on targeted animals. Lead ammunition use by WS-Idaho for wildlife damage management activities is minimal compared to lead use at firing ranges and use for hunting, fishing, and shooting sports. The national WS programs' FY08 - FY012 total estimated lead use in all program activities including feral swine damage management was approximately 5.87 tons (12,948 lbs.) with a yearly average of 1.174 tons (2,588 lbs.). The average yearly total amount of lead used in all states by WS (FY08-FY12) is small (0.0017%) compared to the U.S. use of lead from ammunition, shot, and bullets based on data from 2011 (USGS 2011) and is decreasing as WS works to incorporate use of lead free ammunition to the extent practicable.

At the current rate of use, lead ammunition by WS may have the potential to adversely impact individual non-target animals, particularly animals which scavenge carcasses and birds which may inadvertently pick up lead shot when seeking grit for their crop. However, WS total program use of lead ammunition, including ammunition used for feral swine damage management is only a small fraction of lead ammunition used by other entities (e.g., hunting, target shooting). WS adheres to all applicable laws governing the use of lead ammunition in WS activities and landowner/manager desires for lead-free ammunition in their projects. Additionally, WS will shift to lead-free ammunition as new lead-free alternatives that meet WS standards for safety, performance, and humaneness are developed and become reliably available in adequate quantities for program use. Use of lead ammunition by WS is anticipated to decrease over time. Consequently, cumulative impacts of WS use of lead ammunition would be very low. Given that the majority of lead ammunition is used by non-WS entities, the decisions made by states, territories, tribes, federal regulatory agencies, and land management agencies regarding use of lead ammunition will be the greatest factor affecting the cumulative contribution of lead in the environment.

Deposit of lead into soil could occur if, during the use of a firearm, the projectile passes through a predator, if misses occur, or if the predator carcass was not retrieved. Laidlaw et al. (2005) reported that, because of the low mobility of lead in soil, all of the lead that accumulates on the surface layer of the soil is generally retained within the top 20 cm (about 8 inches). In addition, concerns occur that lead from bullets deposited in soil from shooting activities could contaminate ground water or surface water from runoff. Stansley et al. (1992) studied lead levels in water that was subjected directly to high concentrations of lead shot accumulation because of intensive target shooting at several shooting ranges. Lead did not appear to "transport" readily in surface water when soils were neutral or slightly alkaline in pH (i.e., not acidic), but lead did transport more readily under slightly acidic conditions. Although Stansley et al. (1992) detected elevated lead levels in water in a stream and a marsh that were in the shot "fall zones" at a shooting range, the study did not find higher lead levels in a lake into which the stream drained, except for one sample collected near a parking lot. Stansley et al. (1992) believed the lead contamination near the parking lot was due to runoff from the lot, and not from the shooting range areas. The study also indicated that even when lead shot 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 bullet impact areas were far below the "action level" of 15 parts per billion as defined by the EPA (i.e., requiring action to treat the water to remove lead). The study found that the dissolution (i.e., capability of dissolving in water) of lead declines when lead oxides form on the surface areas of the spent bullets and fragments (Craig et al. 1999). Therefore, the transport of lead from bullets or shot distributed across the landscape was reduced once the bullets and shot formed crusty lead oxide deposits on their surfaces, which served to reduce naturally the potential for ground or surface water contamination (Craig et al. 1999). Those studies suggest that, given the very low amount of lead being deposited and the concentrations that would occur from activities conducted by WS-Idaho to reduce predator damage using firearms, as well as most other forms of dry land small game hunting in general, lead contamination from such sources would be minimal to nonexistent.

When WS-Idaho uses shot shells with lead in hazing or shooting, the typical amount of lead distributed by each shot would be 1.0 to 1.5 ounces. High-powered rifle bullets are about 0.3 ounces and about 0.1 ounces for small caliber firearms and pellets for air rifles. WS-Idaho personnel primarily use shotguns during damage management activities, with over 85% of the shots fired occurring by shotgun (e.g., aerial and ground shooting). About 5% of the shots fired by WS-Idaho personnel occur using high-powered rifles and over 10% of the shots fired are to euthanize animals in traps with small caliber pistols (.22) or to shoot birds with air rifles (~0.1 ounces each at most).

On average during FY 2013, property owners or public land managers allowed WS-Idaho to conduct damage management activities on approximately 6.2 million acres, which represents about 11.75% of the land area of Idaho. However, WS-Idaho only conducts activities on a small portion of those areas. For example, a cooperator or a public land grazing allotment may be 1,000 acres in size and WS-Idaho could conduct activities within that 1,000-acre property; however, WS-Idaho may actually only conduct activities on less than 100 acres of the property. WS-Idaho estimates that actual damage management activities occur on 10% (or about 620,000 acres) of the total land area that property owners or public lands managers allow WS-Idaho to conduct damage management activities. Therefore, WS-Idaho actually conducts damage management activities on less than 0.2% of the total land area in Idaho during FY 2013 and WS-Idaho does not conduct shooting using lead projectiles on all of the land area. Thus, at most, WS-Idaho could scatter lead shot or bullets across less 620,000 acres of the land area of Idaho per year. The number of shots fired would be relatively minimal and scattered over considerable portions of the landscape.

The average number of shot shells discharged per coyote taken with aerial shooting is about 5. And in FY 2013, WS-Idaho removed 1,887 coyotes using fixed-wing and helicopter shooting. If all ammunition used during the take of those coyotes was lead and shooting occurred on every acre of land that WS-Idaho conducts activities, WS-Idaho could potentially deposit about 885 pounds of lead from shot shells. During that same FY, WS-Idaho removed 300 coyotes with firearms from ground shooting, and assuming 90% of these coyotes were taken with high-powered rifles using lead bullets and 10% using shotguns, then the amount of lead potentially deposited on every acre of land where WS-Idaho conducts shooting activities was approximately 28 pounds of lead. Coyotes capture in foothold traps and snares during FY 2013 was 469, and assuming that all the coyotes captured in these devices were dispatched with a .22 caliber handgun or rifle, then less than 5 pounds of lead would be potentially deposited. Therefore, if all ammunition was lead and shooting occurred on every acre of land, WS-Idaho would scatter approximately 0.03 ounces of lead per acre in those areas.

The hazard standard set by the EPA for lead concentrations in residential soils is 400 ppm (1 ppm is equivalent to 1 mg/kg or 0.0064 oz/lb) in children's play areas, and 1,200 ppm on average for the rest of a residential yard. Established standards for lead contamination of soil in remote rural areas of the kind where WS-Idaho conducts most activities are not known to exist, but it would be likely the guidelines for residential areas would be more stringent than any such standard that might ever be established for remote rural areas. Laidlaw et al. (2005) reported that, because of the low mobility of lead in soil, all of the lead that accumulates on the surface layer of the soil is generally retained within the top 20 cm (about 8 inches). A representative average weight of soil is in the range of 110 pounds (49.9 kg) per cubic foot (Environmental

Working Group 2001). The number of cubic feet in the top 8 inches of soil in one acre is about 29,000 cubic feet. Therefore, a reasonable estimate of the total weight of the top layer of soil per acre where lead fired from a firearm should remain would be 3.2 million pounds (110 X 29,000) or 1.5 million kilograms. If considered over the amount of land area involved in damage management activities in Idaho during a typical year, the amount of lead distributed by WS-Idaho would constitute an average of about 0.0005 mg/kg of soil (at 0.03 ounce/acre), which would be represent a small fraction of the concentration in the EPA hazard standards for residential area soils.

WS-Idaho estimated the amount of lead in each of the spots on the ground where the soil is impacted by lead shot, and then evaluated the risk of a person encountering one of those spots and becoming exposed to toxic levels of lead. The amount of lead in the soil impact zones of each shot taken was calculated as each shot potentially distributes 1.2 to 1.5 ounces, or 34.0 to 42.5 grams of lead into an approximate 30 inch circle. Using the same estimate of weight per cubic foot of soil and depth of soil in which the lead shot would remain as discussed previously, the amount of lead per unit weight of soil in the 30 inch circle would be about 200 to 260 mg/kg (ppm). Therefore, even if a person were to encounter one of the impact spots on the ground, the amount of lead in the soil would average less than the EPA hazard standard for children's play areas. The chances of someone stumbling across one of the impact spots could be calculated if there were 15,000 30 inch impact spots (shots per year) distributed over 260,000 acres, or more than 11 billion square feet, of landscape – this means that the total area of impact spots for any one year are only three millionth of the area of the affected landscape. It would be highly unlikely for a person to stumble across one of the affected impact spots, but, even if someone did, there would be no health risk unless the person ingested some of the soil and the portion ingested contained some lead eroded from the spent shot. As discussed previously, solid lead exposed to the environment tends to form an oxidizing layer that slows down its ability to be dissolved in water (Craig et al. 1999), which means the lead from spent shot in the soil would tend to remain in place and not distribute throughout the soil. This would further lessen the chance that someone contacting an impact spot would become exposed to lead.

In a review of lead toxicity threats to the California condor, the Center for Biological Diversity et al. (2004) concluded that lead deposits in soils, including those caused by target shooting by the military at shooting ranges on military reservations used by condors, did not pose significant threats to the condor. The concern was that lead might bio-accumulate in herbivores that fed on plants that might uptake the lead from the soil where the target ranges were located. However, the Center for Biological Diversity et al. (2004) reported blood samples from condors that foraged at the military reservation where the target shooting occurred did not show elevated lead levels, and, in fact showed lower lead levels than samples from condors using other areas.

Indirect Benefits to Wildlife: As noted in Chapter 1, relationships among predators and prey are complex, and even PDM projects specifically intended to enhance prey populations, may not always have the intended consequences. Effective programs to benefit specific species of wildlife requested by state and federal wildlife management agencies are generally conducted in critical seasons and locations that are most likely to benefit the species to be protected (e.g., during periods and locations of birthing/nesting and when vulnerable juveniles are present). PDM conducted for livestock protection is usually of lower intensity than projects for the protection of sensitive wildlife species. As noted in the Chapter 4 sections on effects on target predator populations for each alternative, cumulative impacts of Idaho PDM activities are generally low relative to other known sources of mortality and total population sizes, and/or are within sustainable harvest thresholds identified for the target species and will not cause sustained predator population declines. Due to immigration and compensatory mortality and natality, local population declines resulting from PDM are localized, short-term and unlikely to last for the duration of a year. Consequently, although PDM for livestock protection has the potential for some indirect benefits to wildlife, any potential benefits are likely to be limited and highly localized or associated with intensity of removal for PDM atypical of that which is conducted by WS-Idaho. See also discussion of Dinkins et al. (2016) below.

WS-Idaho Impact on Biodiversity and Ecosystem Resilience. Biodiversity refers to the variety of species within an ecosystem. Ecosystem resilience refers to the ability of individual species and ecosystems to withstand unpredictable fluctuations in environmental conditions (e.g., drought) without jeopardy to species survival or changes in ecosystem structure. Predators, particularly apex predators, can have a pronounced impact on biodiversity and ecosystem resilience, (Estes et al. 2011, Miller et al. 2001). In general, ecosystems that are less complex in terms of biodiversity and trophic levels, are more susceptible to adverse impacts and stressors such as climate change; disease outbreaks, introduction of invasive species, disease, etc. (e.g., reduced ecosystem resilience; Beschta et al. 2013, Crooks and Soulé 1999, Ritchie and Johnson 2009, Estes et al. 2011, Bergstrom et al. 2014). For example, in a multi-predator system, impacts of the decline in one predator can be buffered through compensatory predation by other predator species, as has been observed in the Canada lynx and hare cycle (Krebs et al. 2001). Opportunistic predators such as coyotes that can switch their prey use depending on availability can help to maintain prey assemblages and the associated structure of the plant community (Miller et al. 2001).

Predators impact ecosystems directly through predation and exclusion/reduction in populations of other predators/mesopredators, and indirectly through alteration of prey behavior and habitat use, limiting the abundance of prey populations and alteration of impacts these species have on other levels of the food web (see discussion of trophic cascades below; Miller et al. 2001, Prugh et al. 2009, Ritchie and Johnson 2009, Estes et al. 2011, Wallach et al 2010, Miller et al. 2012). Foraging pressure by predators can help to suppress dominant prey species and can create ecological boundaries that create opportunities for less dominant prey species and promote biodiversity in the system (Henke and Bryant 1999, Miller et al. 2001). The loss of apex predators from an ecosystem reduces biodiversity and shortens the food web length in the system which may alter the presence and abundance of mesopredators, increase the intensity of herbivory, or cause sifts in herbivore and small prey populations impacted by mesopredators, and ultimately impact the abundance and composition of plant communities, soil structure, nutrients and even physical characteristics of the environment (Diamond 1992, Berger et al. 2001, Miller et al. 2001, Beschta and Ripple 2006, Ripple and Beschta 2006, Beschta et al. 2008, Prugh et al. 2009, Estes et al. 2011).

Some authors and members of the public have raised concerns that PDM actions by WS-Idaho may result in unintentional adverse impacts on biodiversity and ecosystem resilience by eliminating or reducing predator populations (e.g., Estes et al. 2011, Bergstrom et al. 2014). Presence of native predators in a healthy ecosystem may also improve the ability of the system to resist adverse impacts of invasive species. Wallach et al. (2010) found that increases in dingo populations that occurred in the absence of exclusion fencing and poison baiting result in decreases in mesopredators and generalist herbivores and an increase in small and intermediate-weight mammals. Allowing predator populations to achieve a degree of social stability (the presence of packs and associated territoriality) was also identified as important because it established natural population control at levels below the maximum that could potentially be sustained by the prey base. Similarly, a review of scientific literature by Ripple et al. (2010), also indicated that irruptions in cervid populations and associated damage to plant communities and biodiversity (e.g., tree regeneration, presence of shrubs, introduction of invasive species, and loss of species dependent upon vegetation damaged by deer) occurred in most instances where large predators were removed but only a few instances where large predators were present. A review of studies of large predators on prey species abundance by Beschta and Ripple (2012) provided evidence that the presence of combinations of wolves and bears (*Ursus* spp.) was able to limit herbivore densities and associated impacts on ecosystems over that of systems with just bears. In systems with bears but without wolves or where wolves were rare, herbivore densities increased sharply with net primary productivity of the system indicating that cervid population fluctuations were highly linked to food supply. In systems with wolves, herbivore density increased with primary productivity, but at a much lower rate and magnitude than for systems without wolves indicating that large predators, or at least combinations of large predators, can put sufficient pressure on prey populations to mitigate population fluctuations driven by food availability.

WS-Idaho damage management activities would occur in localized areas of Idaho and would not be conducted throughout the year, but would occur for short periods after damage had occurred (i.e., reactive damage management). Activities conducted to reduce threats of damage (i.e., proactive damage management) would likely occur for short periods (90 to 180 days) during the time of year when addressing predators would be the most beneficial to reducing threats of damage (e.g., the period of time immediately preceding and during calving and lambing in the spring). On average, WS-Idaho conducted activities on properties comprising nearly 6.2 million acres during FY 2013, which would represent about 11.7% of the land area per year in Idaho. WS-Idaho generally only conducts activities on a small portion of the land acres allowed under an MOU, AWP, cooperative service agreement or other comparable document. For example, a landowner may allow WS-Idaho to conduct activities on the 1,000 acres they own but WS-Idaho personnel might only conduct activities on 5 acres of the property. In addition, the number of predators addressed annually by WS-Idaho and other entities is likely a small percentage of the actual populations of those species in the State. Therefore, the effects on biodiversity would be of low magnitude.

Most evaluations of the impacts of predator removal or loss on biodiversity and ecosystem function involve systems wherein the predator species has been completely removed from the environment for years (e.g., Berger et al. 2001, Beschta and Ripple 2006, Beschta et al. 2008, Frank 2008, Beschta and Ripple 2009, Gill et al. 2009, Ripple et al. 2010, Beschta and Ripple 2012b). WS-Idaho's actions will not result in long-term extirpation or eradication of any wildlife species, so findings of most of these studies are not directly relevant to the current analysis. WS-Idaho operates in accordance with international, federal and State laws and regulations enacted to ensure species viability. WS-Idaho operates on a relatively small percentage of the land area of Idaho and take is only a small proportion of the total population of any species as analyzed in Chapter 4. Analysis of impacts on target species in Section 4.2.1.1 and elsewhere in this section indicates the current WS-Idaho PDM program will not result in the direct or indirect loss of any wildlife species population or sustained reduction in local predator population densities. Any reduction of a local population or groups would be temporary because natural immigration from adjacent areas or reproduction from remaining animals would replace the animals removed unless actions are taken by the landowner/manager to make the site unattractive to the target species. The limited nature of WS-Idaho take of most predator species listed in this EA is so low that substantive shifts in population age structure are not anticipated (Section 4.2.1.1) and further discussions of this issue will focus on removal of coyotes, which are the species most commonly taken by WS-Idaho.

Henke (1992) and Henke and Bryant (1999) documented a decline in species richness and rodent diversity and increases in relative abundance of badgers, bobcats and gray foxes in areas of Texas where *year-round* coyote removals resulted in a sustained 48% reduction in the local coyote population. Cottontail rabbit density and raptor richness, species diversity and density did not differ between control and treatment areas. However, the year-round level of coyote removals, which were documented in Henke (1992) and Henke and Bryant (1999) does not occur during normal WS-Idaho PDM operations which would occur in Idaho under Alternative 1. Similarly, the degree of predator control (exclusion or sustained year-round intensive population reduction efforts via the use of toxicants), was far greater in the study by Wallach et al. (2010) than occurs as a result of PDM that would be conducted by WS-Idaho. Based on findings of Gese (2005), both the number of coyotes and the number of packs in areas with PDM patterns similar to that of WS-Idaho had returned to pre-control levels within 8 months. Although there was evidence of a reduction in the average age of the population, there was no evidence that this resulted in an increase in coyote densities above pre-control levels. Based on this information, we conclude that the impacts of the current WS-Idaho operations (Alternative 1) are not of sufficient magnitude or scope at the local or state level to adversely impact biodiversity or ecosystem resilience.

Impact on Trophic Cascades Including Potential for Mesopredator Release and Increases in Prey Populations. The term trophic cascade refers to the relationships among predators and prey in ecological systems that affect the abundance, biomass, or productivity of a population, community or trophic level (Beschta and Ripple 2009). 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. The presence of the predator causes reductions in the size of the prey populations or causes the prey population to alter its use of habitat (e.g., landscape of fear; Laundré et al. 2010) which, in turn, impacts plant community composition and health. Relationships are not restricted to top-down influence of predators on prey but also include the "bottom up" impacts of prey and primary producers (e.g., plants) on other levels of the system. 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 (Beschta and Ripple 2012a, Beschta et al. 2008, Beschta and Ripple 2006, Naiman and Rogers 1997). Relationships in trophic cascades are not limited to simple linear progressions, 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. 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, and eventually food availability for other species of predators including grizzly bear (Ripple et al. 2013a, Beschta and Ripple 2012b). In the Midwest, changes in coyote activity were documented to impact white-tailed deer activity and associated impacts on plant community composition (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.

The issue of trophic cascades also refers to the impact the presence or absence of a larger apex predator (e.g., wolves or coyotes) has on another predator (fox, raccoons, feral cats) that may have different impacts on prey populations (aka. mesopredator release; Crooks and Soule´ (1999), Berger et al. 2008; Prugh et al. 2009, Brashares et al. 2010, Miller et al. 2012, Newsome and Ripple 2014). For example, Berger and Conner (2008) compared causes and rates of pronghorn antelope mortality in sections of Wyoming with and without wolves. Coyote predation was the primary cause of mortality in all sites, but coyote predation was 34% lower in sites with wolves. The decrease in pronghorn mortality rates was estimated to be sufficient to change the trend for the population from decreasing to increasing. In some cases, mesopredators may have similar or greater impacts on prey species of interest than the apex predator of initial concern. The presence of coyotes in an area has been shown to limit the density of smaller predators, which may prey more heavily on songbirds, ground nesting birds such as ducks and game birds, and some rodents (Crooks and Soulé 1999, Levi and Wilmers 2012, Miller et al. 2012). Carnivores such as badgers, bobcats, feral cats and fox may increase in number when coyote populations are reduced (Robinson 1961, Nunley 1977; Crooks and Soulé 1999). Recovery of wolf populations and associated long-term declines in coyote populations has been documented to result in an increase in survivorship of pronghorn deer fawns (Berger and Conner 2008).

Data on the impacts of coyotes and coyote removal on prey populations are mixed. In two studies conducted in south Texas (Beasom 1974b, 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, rodent and lagomorph species were monitored. 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 (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 vegetative food sources were depleted, despite predation. In others, coyotes may limit jackrabbit density and evidence indicated food shortages do not occur to 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. Their study makes no connections between PDM and jackrabbit mortality or coyote populations. In fact, the coyote population in Wagner and Stoddart (1972) was subject to more sustained and intensive control than is expected to occur under the current WS-Idaho PDM program with coyotes taken through use of aerial shooting, trapping for bounties and pelts and the use of 1,080 poison bait stations that were placed in the fall and recovered in the spring (Wagner and Stoddart 1972). 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 impact 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. The authors determined that 10-year cycle in snowshoe hares is the result of an interaction between predation and food supplies, with predation playing the principle role in driving the cycle in the hare population. Mammalian predator (primarily coyotes and Canada lynx) abundance was strongly linked to abundance of hares, lagging the hare cycle by 1-2 years. Although Canada lynx and coyotes were key predators impacting hare survival, many species of predators were involved in the cycle, and the authors were unable to pinpoint the specific role of any one predator species. The importance of a range of predators in the system is illustrated by the 10-year cycle on Anticosti Island on the St. Lawrence River in eastern Canada. Canada lynx have been extirpated from the island, but the hare cycle persists, likely due to compensatory predation by other species (Stenseth et al. 1998). 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 impact chronic stress, the ability of hares to avoid predators and reproductive output. Interestingly, the study implicated long-range movement of predators as the potential mechanism behind the synchronisity of the snowshoe hare population cycles over large geographic regions. As indicated above, the role of predators and food supplies appears to vary. Stevens (2010) provided an example of a system in Sweden in which red foxes 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.

Henke (1995) reviewed literature concerning coyote-prey interactions and concluded that short- term coyote removal efforts (<6 months per year) typically did not result in increases of small mammal prey species populations. This finding is supported by Gese (2005) in which local coyote populations in a 131 mi^2 study area of up to 60 to 70% of the local coyote population in two consecutive years did not appear to have an impact on local lagomorph abundance. Some of the reason for the lack of impact noted by Gese (2005) may have been attributable to the fact that coyote pack size and density in the project area returned to pre-removal levels within 8 months of removal. Henke (1995) also concluded that long-term intensive coyote removal (nine months or longer per year) could, in some circumstances, result in changes to the rodent and rabbit species composition in the area where removals occurred, which could lead to changes in plant species composition and forage abundance. Henke (1995) based the conclusion that long-term intensive coyote removal could result in change to prey populations on a previous study (Henke 1992) that was conducted in the rolling plains area of Texas that involved one year of pretreatment and two years of treatment. Removals occurred year round and resulted in a sustained reduction in the coyote population of approximately 48%. After the initiation of coyote removal, species richness and rodent diversity declined in treatment areas and relative abundance of badgers, bobcats and gray foxes increased. Cottontail rabbit density and raptor richness, species diversity and density did not differ between control and treatment areas. However, the sustained reduction in coyote populations (and presumably other mesopredators that might be released by the reduction in coyotes) resulting from restoration of wolf populations resulted in increases in the number of voles within 3 km of wolf dens (Miller et al. 2012).

One recent study (Dinkins et al. 2016) looked at the indirect effects of WS' removal of ravens and coyotes for livestock protection in Wyoming on sage grouse nest success. Their study concluded that even when raven removals were not conducted specifically for sage-grouse protection, decreases in raven density associated with livestock protection were associated with increases in sage-grouse nest success. However, Dinkins et al. (2016) also observed that sage-grouse nest success decreased with intensity of coyote removal (coyotes per unit area) in areas with greater precipitation the week before the nest failed. The authors state that the decrease in nest success might be due to mesopredator release, a change in mesopredator behavior such as an expansion of home ranges, a change in mesopredator foraging success under wet weather conditions or a combination of the above. However, there were no direct estimates of coyote or mesopredator abundance in this study before or after treatment and the cause of nest failures was not determined, which complicates determinations regarding the role of mesopredator release and understanding of the magnitude of the coyote removal effort. As with Henke (1999), duration and intensity of coyote removal may have been a key factor. Dinkins et al. (2016) did not provide an estimate of coyote density prior to removals for PDM, nor did it provide data on coyotes removed outside the November-April time interval of interest to the study (coyotes removed for PDM from May-Oct were not included. Differences in data collected and level of detail provided confound comparisons of the intensity of coyote removal in Dinkins et al. (2016) to other PDM studies or the intensity of PDM typical for the WS-Idaho program. However, consultation with WS-Wyoming staff indicate that prior to the initiation of the study, WS-Wyoming received new funds for PDM which allowed the State to increase PDM staffing and effort to 2 specialists per participating county and an increase from 3 to 6 aircraft available for PDM. This is approximately a ten-fold increase in level of effort conducted by WS-Wyoming over that which WS-Idaho is capable of performing (i.e., WS-Idaho has 1 specialist per 4-6 counties and 2 aircraft (WS-Idaho has 3 aircraft but just 2 pilots, therefore only 2 aircraft may fly at any one time) while WS-Wyoming, with the increased funding, has 2 specialists per county and 6 aircraft). Aerial shooting was the primary method for removing coyotes from the project area. This resulting level of coyote removal effort may have been of sufficient magnitude and duration to cause sustained reductions in coyote density in the project area and increase the potential for complications with mesopredator release.

Mezquida et al. (2006) expressed concern that *intense and extended* lethal coyote removal could be detrimental to sage grouse because of positive indirect effects between the two species. Specifically, mesopredator release could result in increases in smaller predators such as fox and badgers which may be more effective predators on sage-grouse nests than coyotes. Reductions in coyotes may also result in increases in jackrabbit populations which could adversely affect habitat for sage-grouse, and indirectly impact predation on sage-grouse by attracting other predators such as golden eagles to areas with sage grouse. Conclusions relative to the impact of coyote removal were based on material from Henke and Bryant (1999), Wagner and Stoddart (1972) discussed above and USFWS (1978) which reference sustained levels of coyote removal including use of toxicants in bait (USFWS 1978) in excess of what is typical for the WS-Idaho program.

Some individuals have expressed concerns that activities such as WS-Idaho's PDM would cause disruptions to trophic cascades or irruptions in prey populations by eliminating or substantially reducing top predators (e.g., Prugh et al. 2009, Ritchie and Johnson 2009, Estes et al. 2011, Bergstrom et al. 2014). WS-Idaho has reviewed these studies but many are not applicable to the types of PDM proposed for Idaho because they involve reviews of the complete absence of apex consumers from the system (e.g., Berger et al. 2001, Bechta and Ripple 2006, Beschta et al. 2008, Frank 2008, Gill et al. 2009, Ripple et al. 2010, Gill et al. 2009, Ripple et al. 2013b; Estes 2011). In some instances, impacts have also been observed in cases where the predators were substantially reduced over an extended period of time (e.g., Henke et al. 1992, 1995, Henke and Bryant 1999, Mezauida et al. 2006, Wallach et al. 2010, discussed above). Ripple and Beschta (2006, 2008) documented herbivore impacts on a site in Zion National Park largely avoided by cougar because of high human activity, an impact sustained over a period of decades. Reduction in cougar 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 (Ripple and Beschta 2006). They also documented diminished black oak (*Quercus keloggii*) recruitment in areas accessible to deer concurrent with reductions in mountain lion populations, but continuous recruitment in refugia where there were physical barriers deer access (Ripple and Beschta 2008). As discussed in detail in Sections 4.2.1.1 and 4.2.5.1, the current program would not result in the elimination of any predator population and impacts on apex predators are only temporary and in relatively small or isolated geographic areas, compared with population levels of target species and would not have significant overall impacts on prey populations or ecosystem function. Consequently, this alternative is not anticipated to result in ecosystem impacts noted in the studies with complete removal or sustained extreme reductions in predator populations.

We did identify one instance wherein short term removals or absence of predators or removal of predators from an area appeared to have the potential for impacts on mesopredator populations. Crooks and Soule´ (1999) conducted an evaluation of the impacts of habitat fragmentation and mesopredator release on scrub-breeding birds in coastal southern California. In their study, coyotes were the apex predator and striped skunks, raccoons, grey fox, domestic cats and opossum were mesopredators. Coyote presence and abundance was primarily correlated with the size of the habitat fragment. Coyote abundance was negatively correlated with total mesopredator abundance. There was a consistent negative correlation between total mesopredator abundance and the number of scrub specialist bird species persisting in habitat fragments, although total fragment area and fragment age were the strongest determinants of bird diversity. Scrub bird diversity was higher in fragments where coyotes were either present or more abundant. Coyote presence and absence and coyote abundance remained a strong predictor of bird species diversity even after accounting for impacts of fragment area and fragment size. Even in areas that were only occasionally visited by coyotes, total abundance of mesopredators was lower in areas that temporarily had coyotes than areas without coyotes, with foxes, cats and skunks most responsive to the presence of coyotes. There was also short-term variance in mesopredator presence concurrent with the temporary presence and absence of coyotes with the majority of avoidance between coyotes and mesopredators driven by coyote-cat interactions. In general interactions among coyotes, cats and birds likely had the strongest impact on the decline and local extinction of scrub-based breeding birds. Approximately 25% of radio-collared cats were killed by coyotes, with an additional indirect impact of residents keeping cats indoors when they believed coyotes were nearby. Cat populations in and around the habitat fragments were maintained at levels far above carrying capacity and predation on birds by cats was identified as being at levels that appeared to be unsustainable. Existing population sizes of some bird species did not exceed 10 individuals in small to moderately sized fragments. In these fragments, even modest increases in predation pressure in combination with other factors could lead to localized extinctions. PDM activities by WS-Idaho is not likely to occur in fragmented habitat and conditions such as those noted by Crooks and Soule´ (1999) because these conditions usually occur in and around urbanized areas. WS-Idaho is not likely to be requested to provide services in these areas, with the exception of very limited projects for the protection of human health and safety.

The public has expressed concerns that killing ravens and magpies will result in increased populations of voles, which kill sage brush by girdling. WS-Idaho recognizes that ravens and magpies prey on live small rodents, reptiles, eggs and young of birds, insects and also feed upon carrion. The limited number of ravens and magpies WS-Idaho would remove statewide from implementing PDM activities will likely not directly result in an explosion of the vole population. Given the mobility of ravens, localized population reductions resulting from PDM actions are not anticipated to have lasting effects that would support such population explosions of voles. In recent years, areas of southern Idaho have experienced varying fluctuations in vole populations, which can be described as typical cyclic patterns of peaks and troughs common to most vole populations in the State (Streubel 2000). Because ravens and magpies are only two of many predator species that feed on voles, the WS-Idaho does not believe its localized damage management actions would result in increases in vole populations that could cause destruction or elimination to the sage-brush ecosystems and damage to agricultural crops.

WS-Idaho only conducts PDM when and where it is needed. When direct management of a depredating animal(s) is needed and requested, efforts focus on management of the specific depredating animal or local group of animals. WS-Idaho does not strive to eliminate or remove predators from any area on a long term basis, no predators or prey would be extirpated and none would be introduced into an ecosystem. As discussed in detail in Section 4.2.1.1 and 4.2.5.1, impacts are generally only on a temporary basis and in relatively small or isolated geographic areas, compared with population levels of target species. Therefore, we conclude that the impacts of WS-Idaho's actions are not of sufficient magnitude or scope to result in ecosystem-level shifts in trophic cascades. Most removal of predators for PDM by WS-Idaho involves removal of one to five individuals from relatively isolated locations. This level of removal is not of sufficient magnitude to result in substantive reductions in predator species abundance. The two primary species taken by WS-Idaho in sufficient numbers to result in substantive short-term local population reductions are coyotes and common ravens (higher level of take by WS-Idaho would only occur under Alternative 5). Given the patchy and limited scope of WS-Idaho damage management actions, repopulation of areas where PDM is conducted occurs relatively quickly, often within a year of the removals. As noted above in the section on biodiversity and ecosystem resilience, removals are not expected to result in long-term reductions in pack density or the number of coyotes present despite reductions in the age structure of the population (Gese 2005). Similarly, ravens are highly mobile and PDM actions are patchy in nature. Unlike coyotes, there is strong evidence to believe that common raven populations are currently being sustained at levels above that normal for the native ecosystem (Section 4.2.1.1). Temporary localized reductions in raven density may help to restore populations more typical of that for the system. Given the above factors, we believe it is unlikely that PDM actions by WS-Idaho would result in unintended adverse impacts on ecosystems through perturbation of trophic cascades.

4.2.1.3 Alternative 1. Impacts on Special Management Areas (SMAs)

Land management agencies charged with preservation and enhancement of SMAs develop policies, regulations and land and resource management plans in accordance with applicable laws to preserve and enhance the valued ecological (e.g., habitat, wildlife, geological features) and cultural (e.g., recreation, spiritual, and existence) values of the sites. These policies and plans are developed in accordance with the applicable laws and policies for public involvement (e.g., NEPA). All PDM actions conducted on public lands are coordinated with the land manager to ensure that the proposed action is consistent with applicable land and resource management plans, agency policy, and laws and regulations (e.g., Wilderness Act). Land managers inform WS-Idaho staff of applicable regulations and plans, areas where special provisions may be needed to conserve sensitive species and other lands uses which must be considered when conducting PDM (e.g., areas with extensive recreational use, research study areas, etc.). A description of federal lands in Idaho, list of PDM methods which could potentially be used on each area and notations as to the anticipated likelihood that PDM would be conducted in each area is provided in Appendix B. Special Management Areas include protected lands such as:

Wilderness Areas (WA)
Wilderness Study Areas (WSAs)
Research Natural Areas (RNAs)
Areas of Critical Environmental Concern (ACEC)
National Recreation Areas (NRAs)
National Conservation Areas (NCAs)
National Monuments (NMs)
National Historic, Scenic and Recreation Trails (NHSRTs)
Wild, Scenic and Recreational Rivers (WSRRs)

WS-Idaho follows policies outlined in the USFS Manual, particularly Section 2323, and the national MOU between USFS and WS when conducting PDM in SMAs on Forest Service lands. Proposed WS-Idaho AWPs are reviewed by USFS during the work planning process to ensure that areas of conflict do not exist. Therefore, WS-Idaho PDM would have almost no effect on wilderness characteristics or management objectives of USFS SMAs. Proposed PDM would be limited in scope to grazing areas with a limited buffer zone for the protection of livestock and would not impair the wilderness designation by Congress.

Interagency MOUs between WS and federal land management agencies have agreed that AWPs will be established locally prior to conducting PDM. WS-Idaho meets with land management agencies to discuss PDM activities and their location. If WS-Idaho were requested to conduct PDM in a SMA, all applicable guidelines, restrictions and SOPs would be followed to ensure PDM would not affect the SMA and its particular values. WS-Idaho PDM actions do not adversely impact or jeopardize target or non-target wildlife populations (Sections 4.2.1.1 and 4.2.1.2) and do not result in substantive habitat alteration. Therefore, it is highly unlikely that PDM activities would impact SMAs.

Wilderness Areas. The Wilderness Act of 1964 defines wilderness character and specifies the uses of Wilderness and the activities allowed or prohibited (BLM 2015*b*). WS-Idaho has not conducted PDM in WAs for the protection of livestock and other resources within the last 5 or more years, but limited work may be conducted in the future if a request is received (Appendix B, Section 4.2.1.3). Future PDM activities may be considered a necessary component of fish and wildlife management as determined by the State and appropriate federal agencies. Activities necessary to remove or otherwise control a native wildlife species to reduce conflicts with other native species will be conducted in a manner consistent with preservation of wilderness character. In Wilderness Areas, WS-Idaho will use the minimum control necessary to conduct PDM activities. To the extent practicable, the control of wildlife causing livestock loss will be limited to the individual(s) causing the damage. Restrictions to control methods and techniques will be outlined in AWPs.

Wilderness Study Areas. WSAs are undeveloped lands that BLM believes meet at least the minimum qualifications of wilderness (roadless, usually larger than 5,000 acres, in a natural condition, with outstanding opportunities for solitude or a primitive and unconfined type of recreation (Harmon and Jarvis 2011) and may also contain ecological, geological, or other features of scientific, scenic or historical value (BLM 2015*c*). The general management standard is that the suitability of the WSAs for preservation as wilderness must not be impaired. Valid existing rights are recognized and grandfathered uses such as grazing and mineral uses are allowed but restricted (BLM 2015*c*). Future WAs designations may come from some of these WSAs or from other undeveloped lands identified by the public.

WS-Idaho PDM actions on BLM WSAs are consistent with Manual 6330 Management of Wilderness Study Areas (BLM 2012) and the MOU between BLM and WS. WS-Idaho' proposed activities on lands under wilderness review (i.e., WSAs) do not conflict with BLM's management objectives as set forth in the Resource Management Plans (RMPs). Proposed WS-Idaho AWPs are presented for review by BLM during the work planning process to ensure that areas of conflict do not exist. PDM under the current program has been limited in scope and has not interrupted the wilderness review processes or impaired the potential suitability for wilderness designation of these areas by Congress. Manual 6330 Section 11. Wildlife, states that predator or other wildlife damage control may be conducted in WSAs to prevent transmission of diseases or parasites affecting human health or safety, to prevent transmission of diseases or parasites affecting other native wildlife, to protect domestic livestock within the WSA or to enhance recovery of federally listed threatened or endangered species. PDM activities must be directed at the specific offending animal or group of animals and carried out so as to minimize impacts to the wilderness characteristics of the WSA (including the natural interaction of native species). Acceptable control measures include lethal and nonlethal methods. Criteria for choosing a particular method include need, location, environmental conditions, the preservation of wilderness characteristics, and applicable Federal and State laws, and should only use the minimum amount of control necessary to solve the problem.

Methods listed in Appendix C as available for potential use by WS-Idaho in WSAs include traps, snares, shooting, and shooting from aircraft. Traps, snares and shooting are the same methods used by licensed hunters and trappers in WSAs if allowed by the IDFG and so long as these activities do not impair the continuation of natural processes. Analysis in Sections 4.2.1.1 and 4.2.1.2 above indicate that the proposed action will not have a substantive adverse impact on target or non-target species populations or biodiversity or ecosystem function. The current BLM guidance on management in wilderness study areas (BLM 2012) does not speak to the use of specific PDM methods, but earlier guidance (BLM 2003) specifically addresses use of aircraft and provides insight in understanding activities which may be conducted in WSAs. Specifically, the guidance notes that, "Shooting of animals from aircraft can occur in WSA's in any State where the activity is consistent with State law and has been previously coordinated with the BLM State Director".

There are about 45 WSAs in Idaho containing about 648,000 acres (BLM 2015*c*). In FY 2011 to FY 2014, WS-Idaho conducted PDM activities on livestock grazing allotments of 4 WSAs (9% of all WSAs), having a total area of about 70,000 acres (about 10.9% of WSAs' total area). Damage Management activities in WSAs may be considered a necessary component of fish and wildlife management as determined by the State and appropriate federal agencies. Activities necessary to remove or otherwise control a native wildlife species to reduce conflicts with other native species will be conducted in a manner consistent with preservation of wilderness character. In WSAs, WS-Idaho will use the minimum control necessary to conduct PDM activities. To the extent practicable, the control of wildlife causing livestock loss will be limited to the individual(s) causing the damage. Shooting of animals from aircraft may be allowed, only where specifically authorized by provisions of State law and consultation with the appropriate BLM or USFS representative. M-44s are not used in WSAs.

From FY 2011 to FY 2014, WS-Idaho has conducted PDM on the following WSAs:

a. Petticoat Peak WSA: Mountain lion predation on livestock - conducted tracking and trailing and trapping efforts for a total of about 10 days.
b. Friedman Creek WSA: Coyote predation on livestock – conducts aerial shooting periodically, but not more than five hours per year.
c. Little Wood River WSA: Coyote predation on livestock – conducts trapping and snaring periodically each year, but for not more than 15 days per year.
d. Great Rift WSA: Coyote predation on livestock – conducts trapping and snaring for about a 30 day period per year and about 2.5 hours of aerial shooting activities per year.
e. Eighteenmile WSA: Coyote predation on livestock – conducted about 15 minutes of aerial shooting activities with fixed-wing aircraft on a single day in 2012.
f. Cedar Butte WSA: Coyote predation on livestock – conducted about 30 minutes of aerial shooting activities on two individual days in 2012.

<u>**Research Natural Areas.**</u> RNAs are federal lands managed for the protection of unusual, scientific or natural characteristics for research and education (USDA

2001a). BLM and USFS policy does not automatically exclude PDM within these areas, but WS-Idaho activities are restricted to corrective damage management only.

From FY 2011 to FY 2014, WS-Idaho has conducted PDM on the following RNAs:

a. Iron Bog RNA: Coyote and black bear predation on livestock – conducts trapping, snaring and calling/shooting for about two months a year. No aerial shooting activities.
b. Trapper Creek RNA: Coyote predation on livestock - conducts trapping for about a 60-day period in the livestock grazing allotment that contains this RNA and no aerial shooting activities.

Areas of Critical Environmental Concern. ACECs are areas managed for the protection of certain qualities or values such as biological, riparian, cultural, historic, scenic, geological, paleontological, recreation, rangeland or sensitive plant species (BLM 2015*d*). In general, PDM has not been needed in these types of areas primarily because, with rare exceptions, livestock have not been grazed on them. However, it may be conducted on such areas if the need arises. Similar to WAs and WSAs, sport hunting and PDM by private individuals using firearms and trail hounds is not always subject to additional restrictions in these areas. The BLM and USFS are responsible for identifying any conflicts that PDM might have with the management of any of these types of areas during the work planning process. If, for example, the respective federal land management agency determines that an area with special management emphasis is to be closed to all public hunting and the use of firearms or to all low level flights, then WS-Idaho would be subject to those restrictions unless provided a special exemption. WS-Idaho conducts very limited PDM, primarily aerial shooting, on or near the Boise Front ACEC primarily in the spring when domestic sheep are migrating through that area. Restrictions on methods for these areas would be established in the AWPs as necessary.

National Research Areas – Sawtooth National Recreation Area (SNRA) and Hells Canyon National Recreation Area (HCNRA). WS-Idaho implements very limited aerial shooting activities and ground methods to address predation on livestock within the boundaries of the SNRA; however, all PDM activities have been on private property. Livestock grazing is permitted on some areas of the HCNRA, but livestock producers have never requested WS-Idaho's assistance with PDM activities. However, should the need to conduct PDM in the HCNRA arise, WS-Idaho would comply with all restrictions outlined in the AWP.

National Conservation Areas – Morley Nelson Snake River Birds of Prey National Conservation Area (MNSRBPNCA). This NCA was established by Congress in 1993 to protect a unique environment that supports one of the world's most dense concentrations of nesting birds of prey and is part of BLMs National Landscape Conservation System (BLM 2015*e*). The BLM manages the area to preserve its remarkable wildlife habitat while providing for other compatible uses of the land (i.e., livestock grazing). WS-Idaho conducts PDM on the NCA on a seasonal basis primarily in the winter and spring when sheep are present. When sheep migrate out of the NCA, PDM activities also decrease. Aerial shooting is the primary control method used, with occasional use of calling and shooting and foothold traps. All PDM activities are conducted in accordance with BLM's policies on land use management and Resource Management Plans or other applicable guidelines.

From FY 2011 to FY 2014, WS-Idaho has conducted PDM activities on the MNSRBPNCA:

a. Coyote predation on livestock – WS-Idaho uses aerial shooting annually in about 50% of the landmass of the MNSRBPNCA, primarily in the winter and spring. Calling/shooting and trapping are used periodically in the winter and spring in about 5% of the landmass.

National Monuments – Craters of the Moon National Monument and Preserve (CMNMP). CMNMP is one of two National Monuments in Idaho. It was created by a proclamation from President Calvin Coolidge in 1924 (NPS 2015*a*). In 1970, Congress reserved a portion of the National Monument to create the Craters of the Moon Wilderness. The CMNMP was expanded in 2000 from a presidential proclamation to include all of the Great Rift Zone south of the original National Monument. The current size is 661,000 acres. As part of an agreement, livestock grazing on BLM lands that were part of the expansion was allowed to continue (BLM 2015*f*). WS-Idaho conducts PDM on these lands primarily in the spring when sheep are migrating from the south to USFS lands to the north. WS-Idaho meets annually with BLM's Twin Falls District officials to discuss PDM AWPs in that District.

From FY 2011 to FY 2014, WS-Idaho has conducted the following PDM activities on the CMNMP:

a. Coyote predation on livestock – WS-Idaho uses aerial shooting, and calling and shooting around the west, east and southern borders of the preserve area. No PDM activities occurred in the WA section or near the visitor's center.

National Historic, Scenic and Recreational Trails. NHSRTs are national trails that are officially established under the authorities of the National Trails System Act (16 U.S.C. 1241-51) and are administered by the National Park Service (NPS 2015*b*). There are three types of trails: 1) National Scenic Trails which are 100 miles or longer, continuous, primarily non-motorized routes of outstanding recreation opportunity; 2) National Historic Trails that commemorate historic (and prehistoric) routes of travel that are of significance to the entire Nation; and, 3) National Recreation Trails that are existing regional and local trails recognized by either the Secretary of Agriculture or the Secretary of the Interior upon application. There are five NHSRTs in Idaho: 1) California National Historic Trail; 2) Oregon National Historic Trail; 3) Nez Perce (Nee-Me-Poo) National Historic Trail; 4) Lewis and

Clark National Historic Trail; and, 5) Continental Divide National Scenic Trail. WS-Idaho does not conduct any PDM activities on any of these NHSRTs and will not conduct any activities unless requested by the appropriate federal agency. WS-Idaho will comply with all rules, regulations and guidelines set forth by such agencies.

Wild, Scenic and Recreational Rivers. WSRRs are rivers that have outstanding natural, cultural, and recreational values in a free-flowing condition. The Wild & Scenic Rivers Act of 1968 permits Congress or the Secretary of the Interior, if certain requirements are met, to designate certain rivers or segments of rivers as Wild, Scenic or Recreational river areas, but such waterways must be administered by either a federal or State agency (http://www.rivers.gov/wsr-act.php, accessed 24 April 2015). Regardless of classification, each river in the National System is administered with the goal of protecting and enhancing the values that caused it to be designated. Designation neither prohibits development nor gives the federal government control over private property. Recreation, agricultural practices, residential development and other uses may continue. Idaho has approximately 891 miles of river designated as wild and scenic. During FY 2011 to FY 2014, WS-Idaho did not conduct any PDM activities on or within ¼ mile of any Wild, Scenic or Recreational rivers.

WS-Idaho will continue to conform to Revisions and Clarifications to H-8550-I, Interim Management Policy for Lands Under Wilderness Review (March 19, 2002 memorandum (No. 2004-140) from BLM and USFS Acting Director to BLM and USFS Washington and Field Office Officials). Because: 1) of the relatively low amount of work on SMA; 2) of the limited and temporary nature of the work; and, 3) WS-Idaho coordinates all planning with federal land managers for conformance to land use plans, WS-Idaho continues to have no impact on SMAs. Any WSA or WA is considered a potential work area for WS-Idaho as outlined at AWP meetings.

Sections 2.2.3 and 3.4.2 discuss the issue of WS-Idaho PDM activity in SMAs such as WAs and WSAs and provides SOPs to ensure no effects in SMAs. PDM is only conducted in designated WSAs under the regulations and policies developed by USFS or BLM for PDM in these areas. PDM in SMAs is only a very minor component of the current program.

Because of the relatively low amount of work on SMAs and because WS-Idaho coordinates all planning with federal land managers for conformance to land use plans, WS-Idaho has relatively no impact on these area.

4.2.1.4 Alternative 1. Humaneness and Ethical Perspectives

Wildlife Values and Ethical Perceptions of Predator Damage Management

Ethics can be defined as the branch of philosophy dealing with values relating to human conduct, with respect to the rightness or wrongness of actions and the goodness and badness of motives and ends (Costello 1992). Individual perceptions of the ethics of wildlife damage management and the appropriateness of specific management techniques depend on the value system of the individual. These values are highly variable (Schmidt 1992, Teel et al. 2002), but can be divided into some general categories (Kellert and Smith 2000, Kellert 1994 Table 4-22). An individual's values on wildlife may have components of various categories and are not restricted to one viewpoint. The tendency to hold a particular value system varies among demographic groups.

Table 4-22. Basic wildlife values [Taken from Kellert and Smith (2000) and Kellert (1994)].

Term	Definition
Aesthetic	Focus on the physical attractiveness and appeal of large
Dominionistic	Focus on the mastery and control of large mammals
Ecologistic	Focus on the interrelationships between wildlife species and natural habitats
Humanistic	Focus on emotional affection and attachment to large mammals
Moralistic	Focus on moral and spiritual importance of large mammals
Naturalistic	Focus on direct experience and contact with large mammals
Negativistic	Focus on fear and aversion of large mammals
Scientific	Focus on knowledge and study of large mammals
Utilitarian	Focus on material and practical benefits of large mammals

Views on ethics of wildlife management also often contain an emotional component that can be variable depending on location and species being considered, can change over time or can be inconsistent (Haider and Jax 2007, Littin et al. 2004). Various types of viewpoints can influence ethics and value systems. For example, one major factor influencing value systems is the degree of dependence on land and natural resources as indicated by rural residency, property ownership and agriculture or resource dependent occupations (Kellert 1994). People in these groups tend to have a higher tendency for utilitarian and dominionistic values. Socioeconomic status also influences wildlife values with a higher occurrence of naturalistic and ecologistic value systems among college educated and higher income North Americans (Kellert 1994).

A recent study by (George et al. 2016) replicated the research of (Kellert 1985) evaluating human uses and values toward animals. The study found that favorable ratings for predators (coyotes and wolves) had increased since the study by Kellert with positive attitudes towards these species increasing 47% and 42%, respectively, and that overall attitudes towards wildlife appeared to be shifting from more dominionistic and utilitarian values to more mutualistic values in which the wildlife are viewed as part of an extended family deserving of caring and compassion and wherein the value of predators in ecosystems is valued. This shift is consistent with success of recent ballot measures intended to improve animal welfare through regulation of domestic animal housing standards and legislation banning or placing severe restrictions on use of devices such as foothold traps.

Individual relationships with the species in question still appear to have a substantial influence on attitudes towards wildlife. For example, Treves (2013) found that public attitudes towards wolves may be increasingly negative among residents of areas occupied by wolves, especially those negatively impacted by wolves. Increasing urban residence has been associated with a rise in positive attitudes towards wildlife, and positive attitudes of this portion of the U.S. population likely outnumber opinions from more rural areas. However, like livestock producers in areas with wolves, attitudes of urban/suburban residents may be influenced by experiences in their area. George et al. (2016) noticed a decrease in positive attitudes towards raccoons and hypothesized that one of the potential reasons could be increased conflicts with raccoons (property damage, health and safety concerns) that are experienced in urban/suburban areas.

Many philosophies on human relationships with animals can be considered relative to ethical perceptions of wildlife damage management techniques. Some of the more prevalent philosophies are discussed here, although there may be others that influence wildlife management decisions.

One philosophy, animal rights, asserts that all animals, both human and nonhuman, are morally equal. Under this philosophy, no use of animals (for research, food and fiber production, recreational uses such as hunting and trapping, zoological displays and animal damage management, etc.) should be conducted or considered acceptable unless that same action is morally acceptable when applied to humans (Schmidt 1989).

Another philosophy, animal welfare, does not promote equal rights for humans and nonhumans, but focuses on reducing pain and suffering in animals. Advocates of this philosophy are not necessarily opposed to utilitarian uses of wildlife but they are concerned with avoiding all unnecessary forms of animal suffering. However, the definition of what constitutes unnecessary is highly subjective (Schmidt 1989). In general, only a small portion of the U.S. population adheres to the animal rights philosophy, but most individuals are concerned about animal welfare.

A third philosophy takes the view that overpopulation of an animal species (whether natural, man-induced or artificial) leads to increased animal suffering when the population suffers malnutrition, disease outbreaks of epidemic proportion or populations crashes due to exceeding the environmental carrying capacity. Advocates for this approach suggest that it is man's obligation to manage animal populations in a manner that reduces potential suffering to a minimal level (Beauchamp and Frey 2011). Similarly, some individuals may feel that humans have a moral obligation to correct environmental impacts that result from the human introduction of invasive species such as feral swine.

When evaluating issues relating to the ethics of conserving or controlling nature, another approach is to consider the reason for the action as the determination of whether the action is ethical or not. For example, often there is a higher level of support for trapping and other lethal methods when the purpose is to protect property and livestock and to reduce spread of disease, rather than for recreation or profit. One model using this approach involves assessing actions from the point of view of humans only (anthropocentric) or from a more general view of all living organisms (biocentric) that considers any harm to living creatures that can be avoided as immoral (Haider and Jax 2007). These approaches have been considered for conservation decisions, but could also be applied to PDM decisions such as those discussed in this EA.

A simple model for determining the ethics of a potential action proposes assessing whether the action is necessary and whether it is justified. In this model, if "yes" is the answer to both questions, the action is ethical (Littin and Mellor 2005). Although the considerations relating to each of these questions may involve several factors, only the two basic questions need to ultimately be answered using this model.

Yet another approach developed a set of six major criteria that can be used to design a pest control program that is ethically sound (Littin et al. 2004). The six major criteria are:

1. The goals, benefits and impacts of action must be clear.
2. The action should only be taken if goals can be achieved.
3. The most effective methods must be used to achieve goals.
4. The methods must be used in the best ways possible.
5. The goals must be assessed.
6. Once goals are achieved, processes should be in place to maintain results.

Using this model, an ideal project is one that follows all six criteria above (a "gold standard" project). If not all six criteria can be followed, an ethically sound pest control program can still be conducted if the project is conducted in a way that moves toward the "gold standard." With unlimited funding and time available, achieving a "gold standard" project may be possible. The challenge in coping with this type of model is how to achieve the best project (as close to the "gold standard" as possible) with the least amount of animal suffering within the constraints imposed by current technology and funding.

Models assigning numerical values to criteria have been proposed to assist in decision- making for alternatives when faced with animal disease outbreaks. One such model attempts to incorporate social ethics as one of the major criteria to be ranked, assigning numerical ranking to issues such as animal welfare (Mourits et al. 2010). Although the primary application of this model is for disease outbreaks, it could also potentially be applied to PDM.

The issue of ethics is evolving over time (Perry and Perry 2008), but no one commonly- accepted standard for the evaluation of ethics relating to control of animal pests exists. Any of the above models, alone or in combination, may provide additional consideration of the ethics of a proposed action. WS has numerous policies, directives and SOPs that provide direction to staff involved in wildlife control reinforcing the achievement of the most appropriate and effective wildlife damage management program possible. Many of these guidance documents incorporate aspects of the ethics consideration issues discussed above. Directives pertaining to WS' activities may be located using the WS home page at https://www.aphis.usda.gov/.../wildlifedamage.

Perceptions of the Humaneness of PDM methods

The issue of humaneness, as it relates to the killing or capturing of wildlife, is an important but very complex concept that can be interpreted in a variety of ways. Humaneness is an individual's perception of harm or pain inflicted on an animal and people may perceive the humaneness of an action differently.

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

Stress has been defined as the effect of physical, physiologic or emotional factors (stressors) that induce an alteration in an animal's base or adaptive state. Responses to stimuli vary among animals based on the animals' experiences, age, species and current condition. Not all forms of stress result in adverse consequences for the animal and some forms of stress serve a positive, adaptive function for the animal. Eustress describes the response of animals to harmless stimuli, which initiate responses that are beneficial to the animal. Neutral stress is the term for response to stimuli which have neither harmful nor beneficial effects to the animal. Distress results when an animal's response to stimuli interferes with its well-being and comfort (AVMA 2007). It is the goal of professional PDM programs to minimize distress in animals to the maximum extent practicable.

Pain, anxiety, and stress caused by restraint and physical exertion due to struggling to escape can manifest physiologically through the sympathetic nervous system and interplay among hormones produced by the hypothalamus, pituitary and adrenal glands. Pain and stress can be measured through short-term increases in cortisol from the adrenal glands, heart rate, blood pressure, body temperature, and breathing rate, and a long-term loss of body weight. Although humans cannot be 100% certain that animals can experience pain-like states, operating on the precautionary principle provides for assuming that animals suffer pain ensures that we take appropriate steps to minimize that risk and treat the animal with respect (Kreeger et al. 1990, Iossa et al. 2007, Sneddon et al. 2014).

The AVMA states "... euthanasia is the act of inducing humane death in an animal" and that "...that if an animal's life is to be taken, it is done with the highest degree of respect, and with an emphasis on making the death as painless and distress free as possible" (AVMA 2013). Additionally, euthanasia methods "should minimize any stress and anxiety experienced by the animal prior to unconsciousness." Although use of euthanasia methods to end an animal's life is desirable, as noted by the AVMA, "for wild and feral animals, many of the recommended means of euthanasia for captive animals are not feasible. In field circumstances, wildlife biologists generally do not use the term euthanasia, but terms such as killing, collecting, or harvesting, recognizing that a distress-free death may not be possible" (AVMA 2001).

AVMA (2013) notes, "while recommendations are made, it is important for those utilizing these recommendations to understand that, in some instances, agents and methods of euthanasia identified as appropriate for a particular species may not be available or may become less than an ideal choice due to differences in circumstances. Conversely, when settings are atypical, methods normally not considered appropriate may become the method of choice. Under such conditions, the humaneness (or perceived lack thereof) of the method used to bring about the death of an animal may be distinguished from the intent or outcome associated with an act of killing. Following this reasoning, it may still be an act of euthanasia to kill an animal in a manner that is not perfectly humane or that would not be considered appropriate in other contexts. For example, due to lack of control over free-ranging wildlife and the stress associated with close human contact, use of a firearm may be the most appropriate means of euthanasia. Also, shooting a suffering animal that is in extremis, instead of catching and transporting it to a clinic to euthanize it using a method normally considered to be appropriate (e.g., barbiturates), is consistent with one interpretation of a good death. The former method promotes the animal's overall interests by ending its misery quickly, even though the latter technique may be considered to be more acceptable under normal conditions (Yeates 2010). Neither of these examples, however, absolves the individual from her or his responsibility to ensure that recommended methods and agents of euthanasia are preferentially used."

AVMA (2013) recognizes that there is "an inherent lack of control over free-ranging wildlife, accepting that firearms may be the most appropriate approach to their euthanasia, and acknowledging that the quickest and most humane means of terminating the life of free-ranging wildlife in a given situation may not always meet all criteria established for euthanasia (i.e., distinguishes between euthanasia and methods that are more accurately characterized as humane killing). Because of the variety of situations that may be encountered, it is difficult to strictly classify methods for termination of free- ranging wildlife as acceptable, acceptable with conditions, or unacceptable. Furthermore, classification of a given method as a means of euthanasia or humane killing may vary by circumstances. These acknowledgments are not intended to condone a lower standard for the humane termination of wildlife. The best methods possible under the circumstances must be applied, and new technology and methods demonstrated to be superior to previously used methods must be embraced.

Multiple federal, State, and local regulations apply to the euthanasia of wildlife. In the United States, management of wildlife is primarily under State jurisdiction. However, some species (e.g., migratory birds, endangered species, marine mammals) are protected and managed by federal agencies or through collaboration between State and federal agencies. Within the context of wildlife management, personnel associated with State and federal agencies and Native American tribes may handle or capture individual animals or groups of animals for various purposes, including research. During the course of these management actions, individual animals may become injured or debilitated and may require euthanasia; in other cases, research or collection protocols dictate that some of them be killed. Sometimes population management requires the lethal control of wildlife species, and, the public may identify and/or present individual animals to State or federal personnel because they are orphaned, sick, injured, diseased (e.g., rabid), or becoming a nuisance."

Several researchers and organizations have attempted to develop objective, comparable, and statistically relevant methods for evaluating traumatic damage and stress in captured animals (Olsen et al. 1986, Onderka et al. 1990, Phillips 1996, Engeman et al. 1997, International Organization for Standardizations (ISO) 1999). These systems provide points for various types of physical trauma, with those points summed for total scores. Scoring of each sample is typically conducted by one or more experienced veterinarians, and the summed scores compared among the veterinarians and the trap type. The concern with scoring methods is that results may be subjective and dependent on the evaluators, and may not be directly comparable among studies (Onderka et al. 1990, Engeman et al. 1997), nor do they include behavioral and physiological responses (Powell and Proulx 2003). Total scores also do not reflect the incremental contribution of individual scores. However, these systems can provide a systematic method for evaluating animal welfare that can be readily compared within a particular study.

In 1991, with the encouragement of animal rights and welfare groups, the European Union (then the European Economic Community) promulgated a trade regulation banning fur imports from countries deemed to be using inhumane traps. This ban was subsequently modified to permit imports from countries using traps that have been evaluated according to international standards for humaneness. These standards were developed by the major fur-exporting countries (Canada, Russia, and the United States), and the 2008 Agreement on International Humane Trapping Standards (AIHTS) was subsequently signed by Canada, Russia, and the EU. The US did not sign the agreement because the primary authority for managing furbearing animals rests with the states and tribes, not the federal government. However, The US cooperated with the Association of Fish and Wildlife Agencies (AFWA) to meet the intent of the agreement to improve animal welfare in US trapping and to avoid the EU trade ban. The U.S., led by AFWA, has developed Best Management Practices (BMP) guidelines for private fur harvest and other trapping activities (AFWA; http://www.fishwildlife.org/?section=best_management _practices). The BMP process scientifically evaluates the traps and trapping systems used for capturing furbearers for specific species and regions in the United States (AFWA 2006). Evaluations are updated periodically as new information and devices become available and are based on animal welfare, efficacy, selectivity, practicality and safety. WS recognizes the value of BMPs and utilizes these guidelines as a basis for policy formulation, recognizing that some devices used in wildlife damage management are not commercially available and that not all devices recommended in the BMPs guidelines for general public use meet the more stringent performance requirements for durability and efficacy under a range of environmental conditions required for use in WS wildlife damage management activities (WS Directive 2.450).

Selectivity of wildlife damage methods is related to the issue of humaneness in that greater selectivity results in less potential suffering of non-target animals. Methods vary in their selectivity for non-target animals. The selectivity of each method is augmented by the skill and discretion of the WS employee applying the technique and on specific measures and modifications designed to reduce or minimize non-target captures. All WS employees are trained in techniques to minimize the risk of capturing non-target wildlife. Section 4.2.1.2 discussed the proposed program's potential for affecting non-target species.

In recent years, the number of individuals and organizations concerned about animal welfare and animal rights has increased substantially (George et al. 2016). While the goal of some animal welfare and rights groups is to ban trapping and all other lethal methods altogether, many groups are concerned with reducing the suffering of animals that are captured or killed by traps or snares, as well as potential risks to non-target animals and pets. Animal welfare organizations and private individuals are concerned that some methods used to capture wildlife may cause unnecessary pain and suffering in animals.

Research suggests that with methods such as restraint in foothold traps, changes in the blood chemistry of trapped animals indicate "stress." Blood measurements of fox indicate that this is the case for fox that have been held in traps, snares, and chased by dogs (Kreeger et al. 1990). Marks (2010) used blood chemistry indicators to compare stress to red foxes associated with use of softcatch traps, treadle snares, shooting, cage traps and use of dogs to chase foxes into nets. Physiological data indicated restraint by treadle snare was more stressful for fox than capture in traps, and both methods resulted in higher stress indicators than cage traps, being chased by dogs into netting, and shooting. Marks (2010) noted that use of TTDs may help to reduce stress in animals captured in traps and snares. The situation is likely to be similar for other animals caught in traps, snares, cable restraints or chased by dogs. Use of traps that are demonstrated to minimize suffering and pain such as those recommended in trapping MBPs as well as frequent trap checks, can increase public acceptance of trapping and perceptions of the humaneness of this method (Proulx and Barrett 1990, Andelt et al. 1999). Using experienced and skilled trappers to educate new trappers in the effective use of more humane and selective traps can also improve the overall practice and humaneness of trapping.

The killing of predators during the spring months also has the potential to result in litters of coyotes, red fox and badgers becoming orphaned. When WS-Idaho conducts aerial hunting activities during the April-June period, aerial hunting crews will sometimes kill one or both of a pair of coyotes that likely have a den of pups in the vicinity. WS-Idaho field personnel typically search both from the air and on the ground in a concerted effort to locate the den in these cases in order to dispatch the pups, typically through the use of EPA-registered den fumigant gas cartridges. If the den cannot be located, pups may sometimes be fed and cared for by one or more members of a social group of coyotes associated with that den (Bekoff and Wells 1980). There are likely some cases where the killing of coyotes, red fox or other predators may result in the orphaning of young animals that are still dependent on parental care. The only way to totally avoid this circumstance would be to refrain from conducting any predator removal efforts during this period of time. Unfortunately, this is also the period during which some of the most serious predation problems occur, such as coyotes killing young lambs to feed their pups (Till and Knowlton 1983) or high levels of predation on sage-grouse chicks during their vulnerable first two to three weeks after hatching (Burkepile et al. 2001).

Some members of the public have stated that DRC-1339 is a slow inhumane toxicant and should not be used. WS recognizes that any use of lethal methods, toxicants in particular, is considered by many individuals to be inhumane even if time until death and pain experienced appear to be minimal. The majority of birds that consume the bait die within 24 hours, but most within four to twelve hours. There are no reports available on the pain experienced by birds treated with DRC-1339. Convulsions, spasms or distress calls have not been observed in birds receiving a lethal dose, rather the birds die a quiet death (Schwab et al. 1964 (starlings), Timm 1994). About four hours before death, the birds cease to eat or drink and become listless and inactive. They perch with their feathers ruffled (as if cold) and appear to doze. DRC-1339 causes renal failure in treated birds. Information on acute kidney failure in people indicates that it may be erroneous to assume that birds treated with DRC-1339 experience a very painful death. Symptoms of renal failure vary among individuals, with some individuals experiencing no symptoms while others may experience symptoms such as fluid retention, headache, nausea, fatigue and/or chest pain or pressure and/or seizures (Mayo Clinic 2011, American Urological Association 2016). The product has been assessed as humane and suitable for further investigation into potential use in Australia (Dawes 2006, Bentz et al. 2007).

Analysis of this issue must consider not only the welfare of the animals captured, but also the welfare of humans, livestock and some T/E species if damage management methods are not used. For example, some individuals may perceive techniques used to remove a predator that is killing or injuring pets or livestock as inhumane, while others may believe it is equally or more inhumane to permit pets and livestock that depend upon humans for protection to be injured or killed by predators. Use of livestock guarding animals is commonly considered a humane management alternative, but in some areas, livestock guarding animals and dogs used to pursue wolves, mountain lions or black bears may also be injured or killed.

Some individuals have expressed a preference for the use of cage traps over other nonlethal and lethal capture devices such as foothold traps, snares and cable restraints. Although these devices are an important tool in any integrated PDM program, logistical constraints and problems with species and individual-animal specific variation in vulnerability to PDM methods preclude exclusive use of cage traps to (Way 2002, Shivik et al. 2005). The size and weight of cage traps makes them impractical for remote areas, particularly if it is necessary to set multiple devices to capture a medium to large animal. Cage traps area also not particularly effective for species such as canids (e.g., coyotes and foxes) which are often reluctant to enter cage traps (Way 2002, Shivik et al. 2005). Although injury rates in cage traps are lower than cables and snares, use of cage traps is a not without risk of injury to the captured animal, because animals can injure themselves attempting to escape the trap (e.g., swelling, damage to teeth and muscles: Shivik et al. 2005, Muñoz-Igualada et al. 2008). For example, in a comparison of cable restraints and cage traps to live-capture red fox in Spain (Muñoz-Igualada et al. 2008) cable restraints had higher capture rates than cage traps. One cable restraint tested (Collarum®) was 100% selective for canids and had a 94.4 selectivity overall, while the other cable restraint (Belisle®) tested had a selectivity of 63.4. Both cable restraints had a substantially higher selectivity than cage traps (21.4). Both of the cable restraints also surpassed international standards for humane trapping. An insufficient number of animals were captured in the cage traps for analysis although a cursory review of injuries indicates there were fewer injuries reported for animals caught in cage traps. Similarly, in a Arizona and Texas test comparing foothold traps (Softcatch®), cable restraints (Collarum®), a WS Turman snare that used a throw-arm for foothold capture of coyotes, and cage traps (Tomahawk®). No coyotes were capture in the Tomahawk live trap in contrast to catch rates of 87% for the Collarum, 88% for the WS throw arm, and 100% for the soft Catch. Cage traps were also the least selective for target animals with all animals captured non-target species, in comparison to the WS Turman (50%), Softcatch (69%) and Collums (100%). No indicators of poor welfare were noted for 92% of coyotes captured in the Collarums, 57% of coyotes captured in the WS Turman, and 92% of soft-catch traps. Both the Collarum and softcatch traps surpassed the injury acceptability standards set by the United States of America-European Union Community (1997) which required at least 80% of animals to have no indicators of poor welfare. Lack of coyotes capture in the cage traps precluded comparison of injuries using that method. The studies demonstrate the need to balance the multiple factors regarding humaneness and efficacy when selecting a management methods.

The challenge in coping with this issue is how to achieve the least amount of animal suffering with the constraints imposed by current technology. WS personnel are concerned about animal welfare. WS is aware that techniques like snares, traps and toxicants are controversial, but also believes that these activities are being conducted as humanely and responsibly as practical. WS and the National Wildlife Research Center are striving to bring additional nonlethal damage management alternatives into practical use and to improve the selectivity and humaneness of management devices. Until new findings and products are found practical, a certain amount of animal suffering could occur when some methods are used in situations when nonlethal damage management methods are not practical or effective. WS supports the most humane, selective and effective damage management techniques and would continue to incorporate advances into program activities. WS field employees conducting PDM are highly experienced professionals, skilled in the use of management methods and committed to minimizing pain and suffering. WS Program Directives, SOPs (See Section 3.4.2.4) and training work to ensure that WS PDM methods are used in a manner that is as humane and selective as possible. Other practices which help to improve the efficacy, selectivity and humaneness of WS use of PDM methods include implementing Trapping Best Management Practices where appropriate for PDM actions and compliance with regulations determining trap check intervals.

Alternative 1 would be unacceptable to animal rights advocates, individuals with strong Humanistic and Moralistic values and to others with strong emotional or spiritual bonds with certain wildlife species. Some individuals assert that killing the offending animal is not the response of a moral or enlightened society. Response of other individuals and groups would vary depending on individual assessments of the need for damage management, risk to the target animal population, risk to non-target species and individuals, the degree to which efforts are made to avoid or minimize the pain and suffering associated with the various management techniques and the perceived humaneness of individual methods.

4.2.1.5 Alternative 1. Cultural Impacts Including Impacts on Native American Cultural Uses, Hunting, Non-Consumptive Uses, and Aesthetic Impacts

Recreation encompasses a wide variety of outdoor entertainment in the form of consumptive and non-consumptive uses. Consumptive uses of public lands include hunting, fishing and rock-hounding. Non-consumptive uses include activities such as bird watching, photography, camping, hiking, biking, rock climbing, winter sports and water sports. Recreationists are the general public and their pets, which includes hunting dogs. In a 2010 survey of hunting fishing and wildlife-associated recreation, 246,000 hunters contributed an estimated $478 million in total expenditures to participate in hunting in the state. An estimated 558,000 wildlife watching participants (includes overlap with hunters) contributed approximately $430 million in total expenditures to participate in wildlife watching in the state (USFWS and USBC 2011). These expenditures occurred with the current PDM program in place. WS-Idaho is aware that most concerns of recreationists about PDM centers around the perceived impacts on hunting, photography, camping, hiking, wildlife viewing and pet safety.

Public opinion about the best ways to reduce conflicts between humans and wildlife is highly variable, making the implementation of damage management programs extremely complex. Ideas about how these programs are implemented and conducted are as unique as the almost infinite combinations of philosophies, psyches, aesthetic values, personal attitudes and opinions found in humans. These differences in opinion result in concerns that the proposed action or the alternatives would result in the loss of aesthetic benefits to the general public and resource owners. The mere knowledge that wildlife exists is a positive benefit to many people (Decker and Goff 1987). Some members of the public have expressed concerns that PDM could result in the loss of aesthetic benefits to the public, resource owners or local residents. 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.

Wildlife populations also provide a range of direct and indirect social and economic benefits. Direct benefits are derived from a user's personal relationship or direct contact with wildlife and may include both consumptive (e.g. hunting), or nonconsumptive (e.g., observing or photographing wildlife). Indirect benefits, or indirect exercised values, arise without a human being in direct contact with an animal and are derived from experiences such as looking at pictures or videos of wildlife, reading about wildlife or benefiting from activities or contributions of animals such as their use in research (Decker and Goff 1987). According to Decker and Goff (1987), two forms of indirect benefits exist; bequest and pure existence. Bequest benefits arise from the belief that wildlife should exist for future generations to enjoy, and pure existence benefits accrue from the knowledge that the animals exist in the human environment (Decker and Goff 1987) or that they contribute to the stability of natural ecosystems (e.g. ecological, existence, bequest values; Bishop 1987).

WS-Idaho PDM activities occur on a relatively limited portion of Idaho and the portion of various predator species' populations removed through PDM activities is typically low. In localized areas where WS-Idaho does remove some portion of the predator population, 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 (Gese 2005). Most of the species potentially affected by WS-Idaho PDM activities are relatively abundant, but are not commonly observed because of their secretive and largely nocturnal behavior. The likelihood of getting to see or hear a predator in some localized areas could be temporarily reduced as a result of WS-Idaho PDM activities, but because there is already a low likelihood of seeing a predator, this temporary local reduction in public viewing opportunity would not likely be noticeable in most cases. Additionally, many of the species which could be targeted in this EA may also be taken by hunters and trappers. With the exception of coyotes, and to a much lesser extent skunk and badger, WS-Idaho proposed maximum take is only a very small fraction of take by hunters and trappers (Section 4.2.1.1). Consequently, for most species, the presence or absence of impacts of WS-Idaho PDM activities may not be discernable from impacts of other removals in all, but isolated and localized instances. Overall impacts on predator populations would be relatively low, and opportunities to view, hear or see evidence of predators would still remain. The potential minor reduction in local opportunity to view predators must be weighed against the potential economic harm suffered by livestock owners or others affected by predator damage, if predator control were not implemented.

Game and non-game wildlife populations are not significantly impacted by WS-Idaho's PDM activities on public lands, allowing hunters ample opportunities for pursuit. Recreationists interested in viewing and photography opportunities for wildlife also have ample areas in Idaho that are suitable for seeing abundant wildlife. WS-Idaho activities do not significantly impact animal populations and it does not remove a significant number of any one species. In fact, WS-Idaho activities could bolster local populations of wildlife such as implementing PDM for the protection of game species or T/E species, thereby increasing opportunities for recreational enjoyment.

Some commenters have stated that witnessing aerial hunting activities or encountering WS-Idaho warning signs for PDM devices or animals captured in traps is distressing and has a profound negative impact on their aesthetic and recreational enjoyment of a site. Some individuals may be reluctant to use areas or walk pets in areas where signs are posted. Disturbance (noise) associated with aerial hunting activities has also been reported as adversely impacting some individuals' recreation.

Procedures and policies designed to minimize WS-Idaho activities on recreation are in place. WS-Idaho personnel post signs in prominent places to alert the public that PDM tools are set in an area. On private lands, the cooperators or landowners are aware that PDM control tools are set and can alert visitors using the property of their presence. Landowners determine the areas and timing of equipment placement, thereby avoiding conflicts with recreationists.

For public lands, WS-Idaho coordinates with the different land management agencies to determine high public use areas and for what particular time of the year high use occurs, such as hunting season. WS-Idaho avoids high use recreational areas to the maximum extent practicable and limits the types of equipment used and any actions conducted in these areas are generally to address concerns regarding human health and safety. Similarly, WS-Idaho does not anticipate conducting PDM in National Parks. However, the potential exists that a request could come from the National Park Service, USFWS or IDFG regarding a threat to human health and safety or for research purposes. Methods with low, short-term highly controlled impacts (e.g., calling and shooting) may be given preference over methods which would require a longer WS-Idaho presence in the area (e.g., foothold traps and snares). To the extent practicable, when PDM actions near areas with public use cannot be avoided, WS-Idaho strives to schedule activities at times and in seasons when recreational activity is likely to be low. These areas are designated in AWPs and on maps so PDM does not unnecessarily interfere with recreational activities. Other strategies used by WS-Idaho to reduce risk that PDM activities would adversely impact an individual's recreational experience include setting capture devices well away from roads and trails.

Some individuals may believe their recreational experiences on public lands are impaired by knowing that any lethal PDM actions are occurring on these lands. Others feel that they are being deprived of the aesthetic experience of viewing or hearing coyotes or other predators because of WS-Idaho PDM actions. Occasionally, individuals may have formed an attachment to a specific coyote pack or individual animal. Removal of these packs or animals can be a cause of distress and sorrow for these individuals.

Potential for adverse impacts on recreation is not limited to use of lethal methods. The flashing lights and sounds associated with frightening devices have the potential to adversely impact individuals' outdoor experiences, especially given that these devices are deployed at night when individuals may desire to sleep or enjoy the quiet night sounds of a natural setting. Safety concerns have also been expressed regarding the use of livestock guarding dogs. Livestock guarding dogs may approach people who come near their flocks which, given the large size of the dogs, can be alarming for some people. In rare instances, livestock guarding dogs may perceive recreationists as a threat and behave aggressively, or they may prey on wildlife, or exclude wildlife species other than undesirable predators, from the area near the sheep (Timm and Schmidt 1989, Frank 2011). WS has undertaken efforts to reduce potentially threatening confrontations between livestock guarding dogs and humans that have resulted in limited acceptance and use of livestock guarding dogs in some areas. WS is working collaboratively with livestock producers and land managers on ways to reduce interactions between livestock and recreationists and on the production and dissemination of educational materials and informative signs on livestock protection dogs (Marlow 2016).

As noted above, opinions regarding the impact of PDM on recreation and aesthetic values vary among individuals. An adverse impact associated with PDM actions, such as the use of foothold traps, may be perceived by one individual in one way and may be perceived completely differently by an individual who hunts and traps recreationally. Some individuals believe that PDM is acceptable because it can help bolster certain species populations such as game species (e.g. bighorn sheep or sage-grouse) or sensitive/T/E species.

Table 4.23. Annual average number of wildlife killed on BLM Districts by WS-Idaho from FY 2011 to FY 2014 (MIS 2011, 2012, 2013, 2014). Includes target and non-target.

Predator Species	Coeur d'Alene District	Boise District	Twin Falls District	Idaho Falls District	Average
Badger	0	0	0.5	0.25	0.19
Bobcat	0	0	0	0.25	0.062
Coyote	0	114.75	520.5	236.75	290.7
Feral and free-	0	0	0	0.5	0.12
Pronghorn Antelope	0	0	0.25	0	0.062
Red Fox	0	0	0.25	0	0.062
Striped Skunk	0	0	0.25	0	0.062
Total Killed	**0**	**114.75**	**521.75**	**237.75**	**291.4[1]**

[1] Average will not add up to 100% due to rounding.

During FY 2011 to FY 2014, WS-Idaho averaged killing 291.4 individual wildlife (1.55 wildlife per 100 mi^2) per year on BLM lands and 16.5 wildlife (0.053 wildlife per 100 mi^2) per year on USFS lands (Tables 4.23 and 4.24), which would have little impact on recreation. Given this low density of predator removal on public lands, and the measures noted above, the odds of an individual actually encountering a WS-Idaho PDM device are low. Although the reason for the take of these animals is for PDM, such take also indirectly offers benefits to recreationists because blood samples from some of the mammalian predators are analyzed for plague titers.

Table 4.24. Annual average number of wildlife species killed on USFS by WS-Idaho from FY 2011 to FY 2014 (MIS 2011, 2012, 2013, 2014). Includes target and non-target.

Predator Species	Boise NF	Caribou-Targhee NF	Idaho Panhandle NF	Nez Perce NF	Payette NF	Salmon-Challis NF	Sawtooth NF	Average
Badger	0	0.5	0	0	0	0	0.25	0.1
Black Bear	1.25	0.25	0	0	0.25	0.75	1.75	0.6
Bobcat	0	0	0	0	0	0	0.25	0.04
Coyote	1	84	0	0.75	2.25	0.75	17	15.1
Mountain Lion	0	0.25	0	0	0	0	0	0.04
Mule Deer	0	0.5	0	0	0	0	0	0.07
Porcupine	0	0.5	0	0	0	0	0	0.07
Red Fox	0.25	1.75	0	0	0.25	0	0.25	0.4
Turkey Vulture	0	0	0	0.25	0	0	0	0.04
Total Killed	**1.5**	**89.5**	**0**	**1**	**2.75**	**1.5**	**19.5**	**16.5**[1]

[1] Average will not add up to 100% due to rounding.

Table 4.25. Percent of time aerial shooting activities on land ownership in Idaho during FY 2011 to FY 2014 (MIS 2011, 2012, 2013, 2014).

Land Status	FY				4-Year Average[1]
	2011	2012	2013	2014	
Private	54.6%	53.6%	54.8%	56.5%	54.7%
BLM	28%	28.5%	28.7%	27.4%	28.2%
USFS	4.5%	2.4%	0.9%	0.7%	2.2%
Other	12.8%	15.5%	15.5%	15.4%	14.9%

[1] May not add up to 100% due to rounding.

Some groups or individuals have expressed concerns regarding the effects of WS-Idaho's low level aerial shooting flights on non-target wildlife and on public land recreational users. WS-Idaho has agreements for conducting PDM on no more than about 35% of the lands in Idaho and much less for aerial shooting. WS-Idaho conducts PDM on a fraction of the land under agreement, so the actual land affected by all of WS-Idaho PDM activities per year is only about 11.6% of the lands in Idaho. However, WS-Idaho conducts aerial operations on even a smaller percentage of the lands in Idaho: 2.6% in FY 2011; 5.9% in FY 2012; 5.6% in FY 2013; and, 9.1% in FY 2014. On average between FY 2011 and FY 2014, 54.7% of the land use area receiving aerial shooting was on private property, 28.2% was BLM lands, 2.2% was on USFS lands and 14.9% was other lands (e.g., State, other federal public lands, county, military, and tribal) (Table 4.25).

WS-Idaho concentrates flying efforts during certain times of the year to specific areas such as lambing grounds so the amount of time spent flying over properties under agreement is relatively small on an annual basis. For each land class (e.g., federal, State, etc.) statewide where target predators were killed, the average amount of time spent on each of these lands was 0.89 min/mi^2 flying on private lands, 0.03 min/mi^2 for USFS lands, 0.65 min/mi^2 for BLM lands and 0.93min/mi^2 for other lands[22] in during FY 2011 to FY 2014. Thus, the average amount of time during any given year that WS-Idaho spends on a given property is minimal. Of interest, the area that comprises the “other lands” is extremely small as compared to the vast acreage of BLM property. The affect is that relatively little time spent repeatedly on a small portion of property provides an extremely high ratio of time per square mile. Additionally, acreage flown or direct control performed during PDM by WS-Idaho is tracked by MIS through individual agreements. Therefore, even if a WS-Idaho aerial crew performed work on only 100 acres, the MIS will show it as flying/working the number of acres listed under that specific agreement, which could be and usually is considerably more than the area worked (e.g. 5,000 acres). Additionally, as the majority of low level flying in Idaho is typically conducted in remote spring lambing and calving grounds, it is unlikely that recreationists would find themselves in a situation to be disturbed. With 19 permits issued within Idaho for private individuals to conduct aerial shooting operations (S. Boyd, ISADCB, pers. comm. 2016), some disruption associated with aircraft use is likely attributable to non-WS entities.

In some instances, use of aircraft may have less of an impact on recreation and aesthetic values than some other methods despite any potential noise and visual effects. As noted above, the actual time spent flying in a specific area, especially on public land, was very low. Wagner and Conover (1999) determined that winter proactive aerial hunting resulted in less use of traps snares and M-44s for corrective control during summer months. In situations where there are concerns regarding interactions with summer recreational activities, a brief period of aerial hunting (minutes) may have less impact than more prolonged use of methods such as traps and snares (days).

Nonlethal control methods approved for use on most USFS, BLM and IDL lands includes: mechanical and non-mechanical scare devices; livestock guarding animals; husbandry practices; herding dogs; and chemical and visual repellents. Lethal control methods approved for use on most USFS and BLM lands includes: foothold, cage, culvert and humane-kill traps; neck and leg snares; calling/shooting; decoy dogs; aerial shooting (fixed-wing and helicopter); and, EPA and ISDA registered avicides (DRC- 1339) and predacides (gas cartridges for denning and M-44s). Prior to application of avicides, predacides or chemical repellents, WS-Idaho will ensure compliance with the National Pollution Discharge Elimination System. For each Forest, BLM District or IDL District/Area, there may be specific restrictions to the use of individual control methods regarding when, where and how they may be used. The AWP developed for each public lands Forest or District/Area spells out these restrictions.

[22] Other lands include state, other federal public lands, military, county and tribal. These land classes equates to a relatively high flight time per mi^2 when compared with private, USFS and BLM lands due to the small parcel sizes.

On public lands, WS-Idaho coordinates with the land management agency through AWPs and designates different work zones on maps to reduce potential problems. For example, high-use recreational areas are designated on maps associated with the AWP and WS-Idaho does not set equipment within a ¼ mile of these areas. On most USFS Forests, foothold traps may be used during the upland game bird season when hunting dogs may be permitted to range more widely than would normally be the case for pets, but only on a corrective basis during specific occurrence of predation. WS-Idaho does not conduct PDM in high use recreational areas except for the purposes of human health and safety protection and only after receiving a request from the applicable public lands official. High use recreation and other sensitive areas are identified at a site specific level in WS-Idaho AWPs on maps or as new damage situations arise. Human safety zones, planned control areas and restricted or coordinated control areas are identified through interagency coordination.

Conflicts with recreationists are further reduced due to inherent features of PDM. WS-Idaho conducts PDM on public lands almost entirely for grazing allotments with sheep and cattle. Regarding livestock protection and natural resource protection, these areas are generally not used extensively by recreationists at the time WS-Idaho would be conducting PDM. Most recreational areas are set aside for that specific purpose and grazing is not allowed. The highest seasonal PDM activity for the protection of livestock coincides with lambing and calving, which is normally in the spring. During this time, aerial shooting is normally the method of choice because many of the grazing areas have poor access and driving conditions are usually limited by wet grounds. Many recreationists as well as WS-Idaho employees do not have access to these public lands because of these limitations. In addition, WS-Idaho currently averages only 0.65 and 0.03 minutes of flight time per square mile, statewide, on BLM and USFS lands, respectively. Most recreationists are totally unaware of the PDM actions and the quality of the outdoor experience is not disrupted. Thus, WS-Idaho avoids significant effects on recreational users.

Impact on Native American Concerns and Values

Native American tribes have a unique cultural and spiritual relationship with wildlife and native ecosystems. The exact nature of this relationship varies among tribes, groups and families within tribes and among individuals. Consultation with the Nez Perce Tribe indicates that while tribal members maintain and value spiritual and cultural relationships with individual species they are primarily concerned with the wellbeing of the ecosystem as a whole. Tribal members may also harvest wildlife for food or cultural uses or for income. Tribal members may also derive income from providing guide services. Actions which substantively impact wildlife species population density and distribution have the potential to adversely affect tribal members spiritually, culturally and economically. Tribal members may also be concerned that predator removal could result in impacts to trophic cascades that impact other species and plants valued by tribal members.

WS-Idaho recognizes that some actions such as the disturbance associated with aerial hunting or frightening devices, carcasses of animals killed during PDM and temporary localized shifts in species density and distribution due to lethal removal, harassment or the presence of livestock guarding dogs could impact tribal members. Predicting impacts and establishing ways to meet program objectives on tribal members and tribal spiritual practices is complicated by the private nature of some tribal religious practices. In general, based on analysis of impacts on target and non-target species populations, recreation and aesthetics, these impacts are expected to be low. Nonetheless, WS-Idaho recognizes that the program has unique government-to-government obligations to the tribes as established in treaties. WS-Idaho is currently in the process of establishing a regular means of consultation to address and minimize current concerns and any additional concerns that may develop with the ongoing program. Practices to help reduce risks of adverse impacts on tribal members are listed in Section 3.4.2.5.

4.2.1.6 Alternative 1. Impacts on Public and Pet Safety and Environment

Standard operating procedures (SOPs) to reduce risks to public and pet safety and the environment are built into the program and are listed in Chapter 3 under standard operating procedures. Methods that could be used under this alternative that are most likely to result in risks to human health and safety are M-44s, LPCs, gas cartridges, traps and snares, lead ammunition, firearms and aircraft.

The use of chemical drugs and toxicants by WS-Idaho is regulated by EPA under FIFRA, ISDA pesticide laws and WS Policies and Directives. Under this alternative, WS-Idaho would use sodium cyanide in the M-44 device, DRC-1339 in egg, or other baits, sodium flouroacetate in the LPCs and carbon monoxide produced from the gas cartridge used for fumigating coyote, skunk and fox dens. When pesticides, including those referenced above, are used in accordance with label directions, they are highly selective to target individuals or populations and such use has negligible impacts on the environment and risks to the public are extremely low. Although the extent of recreational use on public lands has increased, the safety measures established in WS directives and SOPs in Chapter 3 are sufficient to keep risks to extremely low levels. Although risks associated with use of these methods are not nonexistent, they are extremely low and do not pose a significant threat to human health and safety.

WS-Idaho control methods do not pose a significant potential hazard to employees or the public because all methods and materials are consistently used in a manner known to be safe to the user and the public. This assessment included potential risks to WS employees, the public and non-target animals. While some of the materials and methods used by WS-Idaho have the potential to represent a threat to health and safety if used improperly, problems associated with their misuse have rarely occurred in Idaho. This favorable record is due to training and a certification program for the use of PDM methods such as the M-44, proper use and safety being stressed and mandatory compliance with policies and pesticide labels in using PDM methods. The risk to the public is further reduced because most WS-Idaho PDM methods are used in areas where public access is limited and warning signs are prominently posted to alert the public whenever toxic devices or traps are deployed. WS-Idaho coordinates with cooperators or landowners about where and when PDM methods are to be used, thereby decreasing the likelihood of conflicts with the public and pets.

WS-Idaho PDM activities are also not likely to negatively affect the public in terms of "Environmental Justice" and "Executive Order 12898" (see Section 1.5.2). "Environmental Justice" and "Executive Order 12898" relates to the fair treatment of people of all races, income and culture with respect to the development, implementation and enforcement of environmental laws, regulations and policies. Environmental justice is a priority within USDA, APHIS and WS. Also, all WS activities are evaluated for their impact on the human environment and compliance with Executive Order 12898 to ensure Environmental Justice.

Members of the public use BLM, USFS and IDL lands for bird watching, hiking, camping, solace, scientific studies and natural and aesthetic attributes. For some members of the public, there is strong opposition to the use of toxicants, chemicals, traps, snares and other PDM activities on federal and State public lands. WS-Idaho only applies pesticides when necessary and only those which are registered by the EPA and the ISDA. One of the registration criteria requires that each pesticide have a label that provides information about that product, toxicity and cautionary statements; directions; instructions; and, limitations on how that product can be used. When used in a manner consistent with the labeling, the product poses minimal impacts to the environment and user.

WS-Idaho is committed to implementing PDM activities in a manner that minimizes any negative impacts, conflicts and disturbances to the public who may be recreating, conducting scientific studies and enjoying the aesthetic attributes on BLM, USFS and State lands within the proposed project sites. Should WS-Idaho encounter any conflicts with the public or receive complaints in relation to implementing PDM activities on federal or State public lands, then the appropriate land management agency will be alerted of the problem and asked to help with resolving any issues. It is very doubtful that WS-Idaho's PDM activities will result in any long-term, lasting adverse impacts to public users of BLM, USFS and State lands.

Risks Associated with Gas Cartridges: Before treating an active burrow or den, the applicator closes the open holes except the one to be treated. This keeps the CO within the burrow or den and allows CO to reach levels high enough to be lethal to the target animal. Label instructions require applicators to verify the target animal is active in the burrow or den to increase efficacy and reduce impacts to non-target animals

(Ramey and Schafer 1996). WS personnel remain at the treatment site and can warn the public and pets away from the treatment area while the product is in use. After combustion of the gas cartridge, the byproducts are Na_2CO_3 (a solid), CO, and N_2 (Ramey and Schafer 1996). USEPA waived the environmental fate studies and data requirements for carbon, sulfur, sodium nitrate, and the byproducts of the gas cartridges (EPA 1991, 2006, 2008). The basis for the waivers is on the ecological effects of the chemicals and the chemicals are widespread or natural occurring in the environment (EPA 1991, 2008). The burning of these products results in simple organic and inorganic compounds, mostly in the form of gases, which diffuse through burrow openings or into the soil. Exposure of the environment is limited and localized, however, and environmental fate studies are not required (EPA 1991). Given the method of use and nature of the product noted above, risks to the public and pets from use of this method is negligible.

<u>Risks associated with use of sodium fluoroacetate (Compound 1080)</u>. Compound 1080 is the active ingredient in the Livestock Protection Collar (LPC). It is currently registered by the EPA and ISDA for use in Idaho, only by WS-Idaho, to reduce coyote damage to domestic sheep and domestic goats and is restricted for use in fenced pastures. The LPC is rarely used by WS-Idaho (zero to 5 projects annually) because it can only be used in very limited situations, as specified on the registration label.

The LPC consists of two rubber reservoirs, each of which contains about one-half ounce of a 1 % solution of sodium fluoroacetate and is attached to the neck of a goat or sheep. The toxicant is dispensed when punctured by the bite of an attacking predator and is selective not only for the target species, but also for target individuals. It specifically targets coyotes because they characteristically attack sheep and goats by grabbing the throat, whereas other predators and dogs generally attack the animal elsewhere on the body (*e.g.*, dogs attack the flanks and mountain lions the skull). As a result, fewer predators and non-target animals are taken to resolve depredations on pastured sheep and goats. The EPA label establishes strict requirements for monitoring animals wearing the collars and disposing of the collars and any material that may be exposed to the product once the collar is punctured. Consequently, risks to the public and pets from use of this device are extremely low.
In response to petition from an environmental advocacy organization, the EPA completed a review of complaints concerning risks to non-target species (including T/E species), environmental contamination and human health and safety risks regarding use of 1080 collars (EPA 2009). Based on the review, the EPA determined that use of the products in accordance with label requirements and revised WS pesticide accounting and storage practices does not pose unreasonable risks to the environment. There have been not instances of human or pet injuries associated with the use of this device in Idaho. Because of the restrictions on use of this method, WS-Idaho is phasing out use of LPCs and expects to have no use of this method in CY 2017.

Risks associated with sodium cyanide. Sodium cyanide is highly toxic to all species including humans. M-44 users carry an antidote kit, which consists of six amyl nitrite pearls, on their person while setting or checking the devices which counteracts the effect of an accidental exposure. WS-Idaho personnel who use the M-44 must be certified by the ISDA. The EPA label for the M-44 includes 26 use restrictions, including a restriction which prohibits use of the device in areas where federally-listed experimental, threatened or endangered species might be adversely affected. Devices may not be placed within 30 feet of carcasses used as draw stations. The device may also not be placed within 200 feet of any lake, stream or other body of water (exclusive of natural depressions which catch and hold rainfall for only short periods of time). Based on the analysis in this EA, and review of M-44 use patterns in the state, WS-Idaho has determined that M-44s will not be used on public lands in Idaho.

In response to petition from an environmental advocacy organization, the EPA completed a review of complaints concerning risks to non-target species (including T/E species), environmental contamination and human health and safety risks regarding use of sodium cyanide (EPA 2009). Based on the review, the EPA revised two of the use restrictions (Restrictions 8 and 9) pertaining to protections for T/E species and the public and pets. Given the updated restrictions, the EPA determined that use of the products in accordance with label requirements and revised WS pesticide accounting and storage practices does not pose unreasonable risks to the environment. Nationwide, there have been only 2 instances of risks to humans from the use of M-44s since the completion of the registration review by EPA, both on private land in Texas. There have been two instances of pet dogs or livestock guard dogs killed by M-44s in Idaho over the period of FY 2011 through FY 2015, both of which occurred on private land, no feral or free-ranging dogs have been taken using M-44s over this period. There have been no incidents involving exposure a member of the public to sodium cyanide from M-44s in Idaho since at least 2009. Given that this method is no longer in use on public lands, and landowners are informed as to the presence of M-44s on their land and are generally able to manage pets accordingly, risks to the public and pets from M-44s are very low.

Risks associated with animal capture devices. Overall risks of injury from capture devices used for PDM are extremely low and are primarily associated with directly manipulating or triggering traps and snares. Human health and safety hazards associated with foothold traps include potential cuts, abrasions, bruises, or possibly bone fractures of the hands or fingers from the accidental triggering of a trap. There is also a tripping/fall hazard that could occur if an individual gets a foot caught in a trap or snare. Generally, most injuries occur while setting or placing traps and snares which results in the WS personnel that are setting or using these devices to be at the greatest risk of incurring such injuries. WS personnel are trained in the safe and effective use of all PDM methods they employ. WS' traps and snares are selectively placed to minimize exposure to the public, pets and other non-target species. Appropriate warning signs are posted on access routes to properties where traps or cable devices are set to alert the public of their presence. Landowners/tenants are aware of where the devices are set and can advise guests regarding the presence of the devices so that appropriate precautions may be taken (e.g., keeping pets on a leash and avoiding areas where devices are set). However, this is not always the case. Over the period of FY 2011 through FY 2015 during use of traps and snares for PDM, 1 feral and free-ranging dog was killed using a traps on public land and 1 domestic/livestock guarding dog was killed on private land in a snare (2015) and a total of 11 dogs were captured and released from traps or snares. Given the low ratio of nontarget dogs killed to overall use of this method (hundreds of target animals captured annually, Table 4.1a), risks to pets associated with the use of traps and snares is low.

There is a risk of bites and scratches to anyone that attempts to release a live animal that is captured in trapping devices. An individual that is unfamiliar with the operation of traps or trapping devices would be at risk for such injuries if attempting to release an unintentionally captured pet from a trap. WS employees are trained in the use of all trapping devices they use and also have catch poles and other animal handling devices including immobilization drugs all of which can help with safe release of captured animals.

Nationally in FY13, WS had 22 injuries, 12 falls, 8 lacerations and other cuts, 2 allergic reactions, 1 finger sprain (cage trap), and 1 puncture from all wildlife damage management and office activities. Two of these injuries were from setting foothold traps while none were known to be associated with the use of snares. Considering the number of employees (~1,900 agency-wide), these incidents are relatively few for the number of hours spent afield. There is also some risk that an employee may be bit when releasing an animal captured in a snare. From FY08 to FY12, WS field personnel in the Western Region were bit 14 times (1 bear, 1 coyote, 2 feral cats, 3 feral dogs, 2 bats, 1 pelican, and 4 unknowns). For context, WS killed 110,005 predators in the Western Region and released 3,751 during this time period. It is likely that all or most bite incidents related to releasing captured animals. If the bite incidents occurred from only the released animals, it would equate to one bite per 341 releases with the unknowns counted as predators. In summary, risks of setting foothold traps are relatively low to WS employees and the general public. In Idaho, there has only been one incident involving a risk to public safety from PDM activities in the last 20 years.

<u>Risks associated with the use of firearms</u>. Firearm use for PDM can be a public safety concern because of the potential for a bullet to travel through or beyond its intended target putting others at risk. To ensure safe use and awareness, WS employees who use firearms to conduct official duties are required to attend an agency-approved firearms safety training course within 3 months of their appointment and a refresher course at least every 2 years thereafter (WS Directive 2.615). All firearm safety precautions are followed by WS-Idaho when conducting damage management and WS personnel comply with all laws and regulations governing the lawful use of firearms. Shooting with shotguns or rifles

may be used to reduce predator damage when lethal methods are determined to be appropriate. Wildlife Services employees, who use firearms as a condition of employment, are required to certify that they meet criteria as stated in the *Lautenberg Amendment* which prohibits firearm possession by anyone who has been convicted of a misdemeanor crime of domestic violence. Use of firearms is virtually 100% selective for target species because WS personnel are trained to verify the target species prior to shooting. Consequently risks to the public and pets from WS use of firearms is negligible.

Risks associated with use of DRC-1339. DRC-1339 is applied in accordance with label instructions to minimize or eliminate the chance the people or pets could encounter treated baits. However, it would be possible for individuals or pets to encounter treated eggs when DRC-1339 is used to reduce raven, magpie or crow predation on livestock using public land. WS monitor other bait applications while in use and can intervene to deter public or pets which may approach DRC-1339 treatment sites using other DRC-1339 applications. WS posts primary entry points to areas where DRC-1339 is used warning people that the bait is in use. All treated eggs are stamped with warning labels or poison symbols. Treated eggs are hard-boiled which would also serve as indicator to any people that encounter the eggs that the egg is not a natural occurrence and should be avoided. Consequently, risks to the public from WS-Idaho's use of DRC-1339 are negligible.

The threat of pets or livestock consuming DRC-1339 treated eggs and receiving lethal doses is virtually nonexistent. Clark (1986) reports that the LD_{50} (LD_{50} is a standard notation for pesticides and it stands for lethal dose 50%, which means that in a controlled experiment, 50% of the animals exposed to a toxicant will die) for domestic dogs, sheep and cows are >100 mg/kg, 400 mg/kg and >10 mg/kg, respectively. In order for a 30 pound (14 kg) dog, a 125 pound (68 kg) sheep, and 1,000 pound (454 kg) cow, to receive an LD_{50} dose of DRC-1339, they would have to consume 70, 1,360 and 227 treated egg baits, respectively. It is highly unlikely that these domestic animals can physically consume that many eggs. Besides, when treated egg baits are used for the purpose of raven removal to protect nesting sage-grouse, the number of treated eggs placed per square mile (640 acres) will most likely never exceed 14 at any one time. So in order for a 30 pound dog, 125 pound sheep and 1,000 pound cow to receive an LD_{50} dose of DRC-1339, they would have to locate and eat all treated eggs that were placed in a 5, 97, and 16 square mile area, respectively. The concerns about pets and livestock receiving lethal doses of DRC-1339 after eating treated egg baits is thus discountable and highly unlikely. There have been no incidents of adverse impacts on the public or pets from DRC-1339 use in Idaho.

Risks associated with the use of lead ammunition. WS-Idaho has determined that the use of lead from ground shooting is not significant in terms of effects from accumulation in the soil (USDA 2005). Very small amounts are used which are sparsely and widely disbursed, rather than concentrated in small areas. Lead artifacts and lead from spent ammunition are relatively stable and are not readily released into aquatic or terrestrial systems (TWS 2008), especially in alkaline soil environments such as sometimes found in Idaho. To minimize the use of lead, WS-Idaho mainly uses lead shot and copper- coated lead shot when shooting from aircraft. Additional discussions of the effects of lead are contained under discussions of effects on non-target species in Section 4.2.1.2.

Executive Order 13045 – Protection of Children from Environmental Health and Safety Risks. Children may suffer disproportionately from environmental health and safety risks for many reasons, including their development, physical and mental status. WS makes it a high priority to identify and assess environmental health and safety risks that may disproportionately affect children. The proposed PDM would use only legally available and approved damage management methods in areas where it is highly unlikely that children would be adversely affected. All products are used in accordance with EPA label instructions which are established to prevent adverse impacts on the environment and human health and safety from registered products. Chapter 3 Section 3.4 lists SOPs for PDM actions including those intended to protect human health and safety. Based on these provisions, WS-Idaho concludes that it would not create an adverse environmental health or safety risk to children from implementing this proposed action. In contrast, the proposed action may reduce adverse environmental health or safety risks by reducing risks (i.e., wildlife disease transmission, wildlife attacks on humans) to which children may potentially be exposed.

Risks Associated with Aerial Shooting: One group has raised as an issue the potential for aircraft accidents by WS aerial shooting operations to cause catastrophic ground fires or pollution as a result of spilled fuel and oil. As a result of these issues, the following information was obtained from Mr. Norm Wiemeyer, Chief, Denver Field Office of the National Transportation Safety Board (the agency that investigates aviation accidents): Regarding major ground or forest fires, Mr. Wiemeyer stated he had no recollection of any major fires caused by government aircraft since he has been in his position beginning in 1987. Also, an informal polling of WS State Directors in the Western Region affirms that no major ground fires have resulted from any WS aviation accidents.

Regarding fuel spills and the potential for environmental hazards from aviation accidents, Mr. Wiemeyer stated that aviation fuel is extremely volatile and will evaporate within a few hours or less to the point that even its odor cannot be detected. Thus, there should be no environmental hazard from unignited fuel spills. The quantities involved in WS aircraft accidents are small (10 to 30 gallons). In most cases, little or no fuel is spilled.

If oil and other fluid spills occur from any WS-Idaho aircraft, we would be responsible for its cleanup, including if spilled on BLM, USFS or National Park

Service lands. With the size of aircraft used by WS-Idaho, the quantities of oil capable of being spilled in any accident are small and insignificant with respect to the potential for environmental damage (i.e., six to eight quarts maximum for reciprocating (piston) engines and three to five quarts for turbine engines). Aircraft used by WS-Idaho are single engine models, so the greatest potential amount of oil that could be spilled in one accident would be about eight quarts.

Petroleum products biodegrade through volatilization and bacterial action, particularly when exposed to oxygen (EPA 2000). Thus, small quantity oil spills on surface soils can be expected to biodegrade readily. Even in subsurface contamination situations involving underground storage facilities which would generally be expected to involve larger quantities than would ever be involved in a small aircraft accident, EPA guidelines provide for "natural attenuation" or volatilization and biodegradation in some situations to mitigate environmental hazards (EPA 2000). Even where oil spills in small aircraft accidents are not cleaned up, the oil does not persist in the environment. Thus, the risk to drinking water appears to be exceedingly low or nonexistent.

For these reasons, the risk of ground fires or fuel/oil pollution from aviation accidents is considered to be low. 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.

Under the current program alternative, PDM methods could be used to resolve complaints involving predators that represent a risk to public health and safety. Recent projects involving predators that represented a human health and safety risk were effectively resolved using PDM methods such as traps and firearms. Surveillance for diseases in wildlife transmissible to humans (e.g., plague) that may be conducted under this alternative aid health departments in understanding and preparing for health hazards that may occur in their area.

4.2.1.7 Alternative 1. Cost Effectiveness

Studies evaluating the cost effectiveness of PDM programs have usually compared the cost of PDM to the cost of predator impacts to the livestock industry, in part because of public concerns that more funding was being spent to prevent predation than the actual cost of predation to producers. Where costs or benefits to resources other than livestock have been considered, they have primarily focused on costs or benefits associated with consumptive uses of wildlife (e.g., hunting). Recently, increased attention has been placed on non-consumptive wildlife values (e.g., wildlife watching), the existence value of wildlife and the value of roles animals play in ecosystems (Loomis 2012). To date, there are no studies assessing the costs and benefits of PDM in context of these services. Total cost benefit ratios could differ if benefits of ecosystem services and non-consumptive values are included in the calculations (Loomis 2012). In the absence of this data, we have provided qualitative assessments on the impacts of the alternatives on non-consumptive values in the sections on "Cultural Impacts Including Impacts on Native American Cultural Uses, Hunting, Non-consumptive Uses, and Aesthetic Impacts" in the section on impacts to non-target species, which considers the role of target predators and impact of PDM on biodiversity, ecosystem resilience and ecosystem function. This section presents the available information on the costs and benefits of PDM.

The three primary mechanisms by which predators can negatively affect livestock profitability are directly through death losses, indirectly through reduced weaning weights caused by stress from the presence or harassment of predators and increased labor and management costs. Direct livestock mortality alone can significantly reduce the viability of the ranching business. A reduction in weaning weights can affect the whole herd and in extreme cases may also threaten insolvency in the ranch business. Labor and management costs associated with increased effects from predators can include an increase in the need for veterinary services and additional herders, among others. Rashford et al. (2010) found that the effect of predators in western Wyoming cow-calf operations was most costly from reduced herd weaning weights, followed by calf death loss to predation and lastly, increased management costs. While the collective impacts on the ranch economy from all three predator effects were not studied, intuitively it would seem that the combination of the three would more significantly reduce ranch business viability. This study suggested that predator control activities would need only to reduce death or weaning weight losses a small amount to be economically efficient. Rashford et al. (2010) also point out the value of protecting the long-term viability of western ranch lands as they provide beneficial public and ecosystem services such as open space and wildlife habitat.

A common concern about government-funded wildlife damage management programs is that the value of livestock losses reported to, or verified by, WS is often less than the cost of providing wildlife damage management services for the protection of livestock. However, this concern, stated in that way, indicates a misconception of the purpose of wildlife damage management for livestock protection, which is not to wait until the value of losses is high, but to prevent or stop losses in order to minimize them. Wildlife damage management would reach its maximum potential success if it prevented all losses, which would mean the value of losses would be zero. However, in the real world, it is not reasonable to expect zero loss. The concern should be whether the cost of providing wildlife damage management services is equal to or greater than the value of livestock losses avoided.

A team of economic specialists from the National Wildlife Research Center in Ft. Collins, Colorado, conducted an economic assessment of select benefits and costs of WS PDM activities in California. The assessment focused primarily on damage in agricultural areas because urban wildlife damage figures were not readily available. Funding for the study was provided by the California Department of Food and

Agriculture Vertebrate Pest Control Research Advisory Committee. Results of the study indicate that for every $1.00 California counties invest in WS, they save between $6.50 and $10.00 in wildlife damage and replacement program costs (Shwiff et al. 2005). The purpose of the study was to determine if County expenditures were justified in terms of livestock saved from predation and did not include the cost of federal contributions to the PDM program.

Other studies have also shown positive results for benefits to costs. An economic assessment of the California Cooperative Animal Damage Control program was completed for a ten-year period between 1980 and 1990. The results showed a cost to benefit ratio of 1:8 for direct producer benefits (USDA 1991). Shwiff and Merrill (2004) reported 5.4 percent increases in numbers of calves brought to market when coyotes were removed by aerial shooting. Bodenchuk et al. (2002) reported predation management benefit-cost ratios of 3:1 up to 27:1 for agricultural resource protection and 2:1 to 22:1 benefit-cost ratios for predation management for wildlife. Wagner and Conover (1999) found that the percentage of lambs lost to coyote predation was reduced from 2.8 percent to less than one percent on grazing allotments in which coyotes were removed three to six months ahead of summer sheep grazing.

Variables that would change the cost to benefit ratio of a predation damage management program include; local market values for livestock, age, class and type of livestock preyed upon, management practices, geographic and demographic differences, local laws and regulations and WS polices, the skill and experience of the individual WS employee responding to the damage request and others.

Connolly (1981) examined the issue of cost effectiveness of federal predator control programs and concluded that public policy decisions have been made to steer the program away from being as cost effective as possible. This is because of the elimination of control methods believed to be effective but less environmentally preferable such as toxic baits. Thus, the increased costs of implementing the remaining available methods were to achieve other public benefits besides livestock protection and could be viewed as mitigation for the loss of effectiveness in reducing damage.

4.2.1.8 Alternative 1. Indirect and Cumulative Impacts

Indirect impacts are impacts that occur as an unintended consequence of another action. In the case of PDM, the primary concerns regarding indirect impacts are the potential for PDM to result in irruptions of prey species and the potential for PDM to impact other levels of the ecosystem through trophic cascades. These issues are addressed in detail in Section 4.2.1.2.

Cumulative impacts, as defined by CEQ (40 CFR 1508.7), are impacts on the environment that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of who undertakes such other actions. Section 4.2.1.1 addresses the cumulative impacts of all known and anticipated impacts on target species populations. Cumulative impacts of unquantified factors such as climate change, habitat fragmentation, and increasing human activity are assessed primarily through review of population trends for wildlife species affected by PDM.

Timber harvest and livestock grazing are expected to continue in Idaho. Residential development, oil and gas extraction and other energy projects, and associated infrastructure development are anticipated to continue to increase (WGO 2008). Idaho WS has no authority to affect decisions of other entities that engage in or approve such actions. 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 Idaho WS.

Oil and gas development can adversely affect certain wildlife species by reducing the amount or quality of available habitat or cause behavioral disturbance. 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 and may influence animal movement patterns and space use of even what would otherwise be desirable habitat (WGA 2008, Halloran et al. 2008). Timber harvest can benefit some wildlife species while negatively affecting others (USFS 1998, 2003). Housing developments in rural areas have also been recognized as having the potential to adversely affect wildlife by diminishing habitat (Gill 1999) and affecting wildlife feeding patterns (Smith et al. 2015). For example, deer and elk 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 (WGA 2008). Agencies responsible for land and resource management are collaborating to help ensure that these impacts do not jeopardize the health of native ecosystems and species (e.g., WGA 2008, USFS 2003, 2010)

Some of the target wildlife species addressed in this EA adapt readily to human-altered environments, including species like ravens which are a record high population levels supported in large part by human-generated food and habitat subsidies (Section 4.2.1.1). Species which readily adapt to human development are among those most likely to come into conflicts with humans. Some target species like grizzly bear and mountain lion and potential non-target species may be less able to adapt to changing conditions. PDM requests involving these species may decrease concurrent with shifts in population size or they could potentially increase as wildlife increasingly comes into contact with humans (e.g., Lambert et al. 2006).

Despite agency and tribal land and wildlife management efforts, new species may be identified as needing additional protection including listing under the ESA. Under this alternative, WS-Idaho would coordinate PDM activities and provide reports on WS PDM actions to land and wildlife management agencies to facilitate management of wildlife under changing conditions. Adjustments to management activities including increasing emphasis on nonlethal methods or avoidance of methods that may result in temporary disturbance to localized wildlife populations would be developed as needed based on ongoing consultations with the tribes and land and wildlife management agencies. Annual monitoring of WS PDM program and target species and non-target species population impacts would identify potential areas where new information (e.g., revised Section 7 consultations), or updates or revisions to the EA would be needed. Revisions would be implemented in accordance with CEQ and APHIS NEPA implementing regulations and applicable regulations such as the ESA.

WS-Idaho's take of non-target species is very low and not of sufficient magnitude to contribute substantively to cumulative adverse impacts on non-target species populations. T/E species populations may be particularly sensitive to loss of individual animals, but WS-Idaho works with the USFWS to assess risks and cumulative impacts to T/E species from the proposed action and has developed appropriate mitigating procedures to minimize potential impacts to these species.

The impact of climate change on wildlife and their habitats is of increasing concern to land management agencies, biologists and members of the public. Most of the species that could be involved in conflicts that are addressed by WS-Idaho under this alternative are abundant through a wide range of climate conditions (e.g., fox, coyote, raccoon, and mountain lion) and may be relatively resilient to change. Other species such as grizzly bear may be less tolerant. Climate change may also alter the frequency and severity of habitat-altering events such as wildfires, weather extremes such as drought, presence of invasive species, and wildlife diseases. Habitat fragmentation associated with development can also adversely affect wildlife species through a range of factors, including but not limited to, alterations in predator and prey abundance and relationships due to habitat change and human-generated food and habitat sources, and reductions in animal movement and genetic exchange among habitat fragments. State, federal and tribal land and wildlife management agencies are working collaboratively to address these issues and preserve wildlife populations for current and future generations. WS-Idaho works with these entities and complies with all applicable State, federal and tribal regulations and policies for the protection of wildlife and their habitats. As noted in Section 1.2.3, WS-Idaho may provide technical or operational assistance in situations where interactions among species have been perturbed to the extent that short-term localized PDM may be of assistance and is requested by the applicable management agency.

Wildlife populations and their habitats are not static, but are in a state of continuing change as ecosystems and the species within them adjust to the cumulative impacts of human activity and changing environmental conditions. State, federal and tribal land and wildlife management agencies address these ongoing changes though monitoring and use of adaptive management practices in which populations and ecosystems are monitored and management actions are adjusted as needed (e.g., adjustments to hunting seasons or license sales, altering grazing timelines and patterns, closing or opening certain areas to public use). All WS-Idaho take of wildlife is reported to and coordinated with applicable State, federal and tribal land and natural resource management agencies to facilitate understanding of cumulative impacts on wildlife populations. WS-Idaho monitors its activities to ensure that WS-Idaho's actions remain consistent with provisions of this EA and maximum take limits analyzed. WS-Idaho also conducts ongoing monitoring to ensure that compliance with regulations for the protection of the environment, such as the ESA, is current. WS-Idaho participates in scientific conferences and monitors the applicable scientific literature for new information relevant to the analysis. This EA will be updated as warranted to address substantive changes if any such changes are identified and needed. Given ongoing WS-Idaho collaboration with State, federal and tribal land and natural resource management agencies, internal monitoring, and the WS-Idaho's commitment to updating the NEPA review as appropriate, risks of adverse indirect or cumulative environmental impacts are low.

4.2.2 Alternative 2: No Federal WS-Idaho PDM Program

This alternative was discussed in 3.2.2. This alternative would terminate all WS-Idaho PDM (operational and technical assistance) on all land classes within Idaho. However, other federal, State and county agencies, tribes and private individuals could conduct PDM in accordance with applicable regulations. ISADCB, by State statute (Section 25-128, Idaho Code), would still have the responsibility to address prevention and control of damage caused by predatory animals and other vertebrate pests. WS-Idaho cooperator funding would likely be reallocated to State or county agencies to provide similar services or State and county agencies may elect to work with private contractors. The extent to which PDM efforts would be similar to Alternative 1 would depend, in part, on the ability of agencies or program recipients to acquire the additional funding to make up for federal funds currently available from WS-Idaho (See Section 3.2.2). Alternatively, land management agencies may seek to make up for funding shortfalls through increased permitting or by setting up a system of volunteers, such as the system of volunteers implemented in Minnesota to address wolf damage while the gray wolf population in the State was not federally protected under the ESA. Land management agencies and other cooperators could also implement more PDM on their own as allowed under State and federal regulations. Overall, PDM activities are expected to initially decline until alternative strategies for providing PDM services are developed at which point, PDM levels under this alternative are expected to reach similar levels to those which occur under Alternative 1.

All PDM methods used by WS-Idaho would be available to non-WS entities except Mesurol, M-44s, LPCs and some uses of DRC-1339. LPCs and Mesurol are rarely used in Idaho and loss of these methods is unlikely to have a substantive impact on PDM conducted by non-WS entities. M-44s are not commonly used by WS-Idaho staff (average 106 coyotes per year – approximately 4% of total annual coyote take by WS-Idaho in FY 2012-FY 2014), and are generally only used in situations where coyotes have proven difficult to remove using other methods. Although M-44s have been registered in for use in other States by non-WS entities (e.g., State employee or private use), given the relatively low number of coyotes taken using M-44s, non-WS entities are likely to compensate for loss of M-44s through more extensive use of traps, snares and shooting. DRC-1339 for use in raven, American crow and black-billed magpie damage management is usually restricted to WS. In the absence of access to DRC-1339, individuals seeking to use lethal methods to remove ravens, crows or magpies would need to resort to more labor intensive methods such as shooting and live-capture and euthanasia.

PDM by non-professional private individuals is expected to increase under this alternative. Without professional oversight, training and experience, the environmental consequences of a no federal program alternative could be greater than under the current program. Private persons conducting PDM may take longer to resolve conflicts, which could result in increased damages. It may also result in an increase in time that PDM equipment would be in use and any associated environmental impacts. It is possible that the inability of some of these private individuals to resolve damage problems could lead to the illegal use of chemical toxicants, which could have a great potential for significant negative impacts on the environment. In some cases, control methods applied by non-agency personnel could be used contrary to their intended or legal use or more than what is recommended or necessary. Private individuals are also not required to provide the same level of accountability; records maintenance; regulatory and policy compliance; and, coordination with other land management agencies as does WS-Idaho. Ultimately, more PDM being conducted by private individuals will result in a reduction in the information available to management agencies, the tribes and the public.

4.2.2.1 Alternative 2. Effects on Target Predator Species Populations

Under this alternative, WS-Idaho would have no impact on target predator populations in Idaho because WS-Idaho would discontinue all involvement in PDM. However, State or county governments, private organizations and individuals conducting PDM would most likely increase PDM actions in proportion to the reduction of services that would normally be provided by WS-Idaho (See Section 3.2.2 for reasoning). After an initial decline while alternative mechanisms for PDM are established, these efforts to reduce or prevent depredations would probably result in effects similar to those of the proposed action depending on the level of effort expended by State and county governments, private persons and organizations. The primary exception is the take of ravens with DRC-1339 for livestock protection (discussed below). Uncertainty regarding the exact nature of impacts on some target species populations would be greater under this alternative because non-WS entities are not required to report take of several of the target species listed in this EA when they are taken for damage management (e.g., coyotes, raccoon, skunks). For the same reasons shown in the population impacts analysis, Section 4.2.1.1, it is highly unlikely that predator populations would be affected substantially by implementation of this alternative. However, the possible use of illegal chemical toxicants, as described in Section 4.2.2, could lead to unknown impacts on carnivore populations.

In FY 2011-2014, WS-Idaho's average take of ravens, magpies and crows to reduce agricultural damage, including depredation on livestock was 141 ravens, 83 magpies, and 13 crows per year. Average annual reported take by non-WS entities (without use of DRC-1339) for the same period was 22 crows, 127 magpies and 40 ravens. Given the relatively low level of take of these species and the reported levels of take by non-WS entities, it seems likely that non-WS entities have the capability to take similar numbers of crows and magpies as WS-Idaho under the current program even without access to DRC-1339. Take of ravens for agricultural damage and protection of livestock may decrease slightly from current levels, depending on the skill of non-WS entities in using methods other than DRC-1339. IDFG is anticipated to continue use of DRC-1339 for sage-grouse protection as described in Alternative 1 and because of the minimal use of this product by WS-Idaho to protect other agricultural resources, the impacts would be similar to the impacts of WS-Idaho's use of DRC-1339 under Alternative 5.

4.2.2.2 Alternative 2. Effects on Non-target Species Populations, Including T/E Species

Under this alternative, WS-Idaho would be unable to provide assistance with PDM activities including activities to protect T/E species and/or sensitive species. The amount of professional oversight in PDM would diminish but might still be available to some extent through IDFG or federal natural resource management agencies. However, the reduction in professional oversight might be anticipated to result in an increase in impacts on non- target species populations over that described for Alternative 1 because the individuals conducting the work may not have the same access to training and current PDM tools and techniques as WS-Idaho employees. In the short term, this alternative could also result in less aerial shooting and increased ground work for predation management, which would result in greater potential risks to non-target animals from an increased use of traps and snares (Wagner and Conover 1999). However, there are already 19 non-WS entities licensed to shoot from aircraft, so we anticipate aerial operations to eventually increase to levels similar to that of WS-Idaho. This alternative would not include the use of DRC-1339 to take ravens for the protection of livestock, so shooting of ravens would presumably increase. Use of DRC-1339 by the IDFG for the protection of natural resource (e.g., sage grouse) is anticipated to occur in the same manner as for Alternative 1. As with reporting of target species take, take of non-target species may not be as thoroughly reported by non-WS entities as is reported by WS-Idaho.

Because the predators removed by WS-Idaho using firearms could be lethally removed by the entities experiencing damage using the same method in the absence of involvement of WS-Idaho, after a short-term decline, use of lead ammunition would be similar or higher than under Alternatives 1, 4 and 5. Non-WS-Idaho entities may not have the proficiency or training received by employees of WS-Idaho in firearm use, which could increase the likelihood of misses and increase total ammunition use. Absent regulations requiring transition to lead-free ammunition, non-WS-Idaho entities may be unwilling to incur the additional cost of lead-free ammunition and may be slower to transition to lead-free ammunition than WS-Idaho. Consequently, overall risks associated with lead ammunition would likely be similar to or slightly higher than for alternatives that include WS-Idaho use of lethal methods.

Private efforts to reduce or prevent depredations would likely increase which may result in less experienced persons implementing control methods leading to a greater take of non-target wildlife than under the current program. Similar to WS-Idaho PDM, private individuals could trap coyotes and unprotected predators year-round. However, private individuals would not be restricted to SOPs such as WS-Idaho's self-imposed restrictions (e.g., setting traps closer than 30 feet to livestock carcasses to avoid capturing scavenging birds or using pan tension devices to exclude smaller animals). Absent a regulatory requirement, they are also less likely to adopt use of lead-free ammunition. Therefore, hazards to raptors, including bald and golden eagles and other non-target animals, could be greater under this alternative. As described in Section 4.2.2, the inappropriate use of chemical toxicants could adversely impact non-target species populations, including T/E species. Therefore, it is likely that more impacts would occur under this alternative than the current program as discussed in Section 4.2.1.2. Aerial shooting, though, would probably not be used as much under this alternative because it requires a permit from ISADCB and pilots experienced at low-level flying and it requires obtaining permission for access to private lands, which would be difficult. Additionally, if more aerial shooting permits are issued by ISADCB, the effects of low level flights on wildlife and wild equines would likely be similar to those discussed in Section 4.2.1.2, barring illegal activities.

4.2.2.3 Alternative 2. Impacts on SMAs

Under this alternative, WS-Idaho would have no impact on SMAs. As noted above, PDM activities may be conducted by entities other than WS-Idaho. As with other factors discussed in Section 4.2.2., we anticipated an initial decline in PDM activities and potential for impacts on SMAs followed by an eventual increase to levels similar to Alternative 1. If the replacement PDM services are provided by State or county agencies, we anticipate that coordination with the land management agencies will occur in a manner similar to the AWPs that WS-Idaho prepares under Alternative 1. However, actions by private entities may not be as closely coordinated with land management agencies and the potential for adverse incidents will be higher than under Alternative 1. Risks to wilderness characteristics in the form of interruption of natural processes could be slightly greater under this alternative if PDM actions are conducted by individuals with less training and experience than WS-Idaho (See Section 4.2.2.2). Therefore, in the long term, this alternative would likely have more negative effects on SMAs than the current program alternative.

4.2.2.4 Alternative 2. Humaneness and Ethical Perspectives

Under this alternative, WS-Idaho would not be involved in PDM in Idaho and therefore, would not employ methods viewed by some persons as inhumane and, thus, have no program effect on humaneness. IDFG, ISADCB, county governments and private individuals would probably provide some level of professional direct control assistance with PDM (but without federal supervision) and would continue to use the PDM methods considered inhumane by some individuals. IDFG, ISADCB, county governments and private individuals would no longer receive training from WS-Idaho, nor would these entities benefit from research by WS focused on improved humaneness, selectivity and nonlethal methods. Use of lethal some lethal PDM methods may decline initially until alternative systems are established by State and county agencies and private sources. Individuals, who are no longer provided professional assistance from WS-Idaho and have experienced resource losses, could conduct lethal control activities on their own. This could have the potential for increased and unnecessary pain and suffering to target and non-target species. Use of foothold traps, snares and shooting by private individuals would probably increase. This could result in less experienced persons implementing use of PDM methods such as traps without modifications like the pan tension devices that exclude smaller non-target animals. Greater take and suffering of non-target wildlife could result. It is possible that frustration caused by the inability of resource owners to reduce losses could lead to illegal use of chemical toxicants. The illegal use of toxicants could result in increased animal suffering.

PDM actions taken by private individuals would probably be less humane than in Alternative 1 for other reasons. WS-Idaho is accountable to public input and human interest groups often focus their attention and opposition on PDM activities employed by WS-Idaho. PDM methods used by private individuals are not subject to the same reporting requirements as WS. The people that perceive some PDM methods as inhumane would be less aware of PDM activities being conducted by private individuals because the private individuals would not be required to provide information under any policies or regulations similar to those WS-Idaho follows. Thus, the perception of inhumane PDM activities would probably be reduced, although the actual occurrence of inhumane PDM activities may increase.

Under this alternative, predation rates would be expected to increase. It could be expected that livestock losses would most likely increase in areas without effective PDM. Therefore, more domestic animals, including livestock and pets, would suffer inhumanely from injuries caused by predation than under the current program.

Therefore, this alternative would likely result in more negative impacts with regard to humaneness than the current program (Alternative 1). This is primarily due to the fact that more private individuals would attempt to alleviate predator damage without professional training and guidance and more domestic animals would be lost to predation.

This alternative may be more acceptable to animal rights activists and to a wider range of animal welfare advocates because WS-Idaho would not be involved in the lethal removal of predators. Livestock producers and others who receive services from WS-Idaho are likely to perceive this alternative as an unethical restriction of their access to legally available damage management techniques from professional, accountable WS employees. Livestock producers and others who receive services from WS-Idaho may also perceive this alternative as an imposition of additional costs of livestock production upon them that results in further unacceptable losses. People concerned about the use of public resources to reduce damage (e.g. enhance profit) on private and public lands may find this alternative preferable to Alternative 1 because no federal allocations to the WS program would be used for PDM in Idaho.

4.2.2.5 Alternative 2. Cultural Impacts including impacts on Native American cultural uses, hunting, non-consumptive uses, and aesthetic impacts

Under this alternative, there would be no WS-Idaho involvement in predation management and, consequentially, no impact on recreation. However, IDFG, ISADCB, county governments and private individuals would probably provide some level of PDM. Private efforts to reduce or prevent depredations on livestock allotments on public lands would likely increase, which could result in less experienced persons implementing PDM methods and a greater impact on recreation than Alternative 1. Aerial shooting would probably be greatly reduced under this alternative because it requires pilots with experience at low level flying and a permit from ISADCB. Even if issuance of airborne hunting permits increased, impacts are not likely to be greater than analyzed for Alternative 1. A reduction in aerial shooting would result in an increase in the amount of ground traffic and hours of PDM required for an equivalent level of predation management (Wagner and Conover 1999). This increase in PDM activity on the ground would increase the risk of damage to the environment from vehicular traffic and increase the likelihood of a conflict between PDM and recreational activities.

WS-Idaho would not impact hunting and non-consumptive uses with the no federal program alternative. ISADCB or IDFG would probably provide some level of direct control assistance with PDM or contract for those services. PDM activities would have similar effects on recreation as described under the current program alternative, except that with no WS-Idaho involvement, effects would be decreased proportionately. Private efforts to reduce or prevent depredations would likely increase, which could result in less experienced persons implementing PDM methods leading to a greater effect on recreation than described under the current program alternative. As discussed with other issues, it is possible that the frustration caused by the inability of novice PDM persons to reduce losses could lead to the illegal use of chemical toxicants which could impact recreationists and their pets because it violates the label guidelines for safe use of the product. This activity could also have impacts on game species, as described for predators in Section 4.2.2.1 and non-target species in Section 4.2.2.2. Aerial shooting would probably not be used as much under this alternative because it requires pilots with experience at low level flying and a permit from ISADCB, and therefore, recreationists would be affected minimally with this PDM method. Even if ISADCB issued several more permits, the effects would likely be similar to those in Section 4.2.1.2, barring illegal activities. PDM activities would probably cause damage to the environment from off-road vehicle use where WS-Idaho would normally aerial hunt. This is because much of the desert environment is sensitive by nature and vehicles can leave long-lasting scars, especially when vehicles are used during the wet season because ruts are made. These scars can be an eyesore to recreationists. Therefore, it is likely that greater negative impacts could occur under this alternative than the current program as discussed in Section 4.2.1.4.

Under this alternative, WS-Idaho would not be available to consult with Native American tribes and work with tribes to address their concerns. State, local and private entities do not have the same obligation to work with tribes as federal agencies, and tribal opportunities to work with agencies to reduce risk of adverse impacts on tribal resources and culture would be diminished under this alternative. As discussed relative to impacts on target and non-target species, reporting of take of many species for PDM is not required by private individuals, so tribal and agency access to information on what PDM activities are conducted within the ceded territories will also be limited. Risks of adverse spiritual, cultural and economic impacts to tribal members are therefore the highest of all the alternatives under this alternative.

4.2.2.6 Alternative 2. Impacts on Public and Pet Safety and the Environment

Under this alternative, there would be no WS-Idaho involvement in PDM and, consequentially, there would not be any risks to human health and safety from WS-Idaho pesticide or aircraft use. Conversely, WS-Idaho would not be available to provide assistance with wildlife threats to human health and safety. However, IDFG, ISADCB, county governments and private individuals would probably provide some level of PDM assistance. Private efforts to reduce or prevent depredations on livestock grazing allotments would likely increase, which could result in less experienced persons implementing PDM methods and greater health and safety risks associated with improper use of PDM tools. Aerial shooting would probably be greatly reduced under this alternative because it requires pilots with experience at low level flying and a permit from ISADCB. Even if ISADCB increased issuance of permits, impacts on public safety are not likely to be greater than what was analyzed for Alternative 1. The reduction in aerial shooting would result in further increases in the use of ground-based PDM techniques (Wagner and Conover 1999). As stated above, increased ground-based private efforts to reduce or prevent depredations on livestock allotments could result in less experienced persons implementing PDM methods and greater health and safety risks associated with improper use of PDM tools.

WS-Idaho would have no effect on public safety, the environment or Environmental Justice (Executive Order 12898) issues under this alternative. ISADCB or IDFG would probably provide some level of PDM without federal supervision and their effects of actions by agency personnel's implementation of PDM would be similar to those discussed under Section 4.2.1.6. Although the State is anticipated to identify alternative means to provide PDM services, the loss of federal funds would necessitate acquisition of funding from other sources, shifting more of the costs of PDM to producers, or seeking alternative systems, such as private contractors or certified volunteers. Compared to the current program alternative, private individuals would likely have more significant negative effects on the environment and human safety. This could result from untrained and unlicensed individuals using PDM methods and toxicants, legal and illegal. As discussed in Section 4.2.2.1, it is possible that individuals frustrated by their inability to reduce losses could resort to illegally using chemical toxicants and such unregulated use could lead to unknown impacts on public safety. In addition, private individuals are not subject to the same reporting and disclosure standards as WS and can conduct PDM for unprotected species year-round and without many of the policies, regulations and restrictions that WS-Idaho personnel must follow. Of the alternatives, this one would have the greatest potential for negative impacts on public safety, minority and low income populations and the environment.

In addition to some of the problems noted above, under this alternative, WS-Idaho would not be able to respond to predator complaints involving human health and safety. ISADCB or IDFG could respond to complaints within reasonable proximity of their duty stations. However, it is unlikely that ISADCB or IDFG would be able to respond to all predator complaints involving human health and safety because it would lack resources and methods that can only be used or supervised by WS-Idaho. Therefore, human health and safety problems associated with predators would likely increase and either go unresolved or be handled by private individuals with similar risks described above.

4.2.2.7 Alternative 2. Cost Effectiveness

Federal funds would not be expended by WS-Idaho for PDM activities in Idaho. WS-Idaho currently provides much of the supplies for PDM and supervision of the activities under Alternative 1. Damage control costs could be large or small depending on the role of the public sector. Although the State is anticipated to identify alternative means to provide PDM services, the loss of federal funds would necessitate acquisition of funding from other sources, shifting more of the costs of PDM to producers, or seeking alternative systems, such as private contractors or certified volunteers. Increases in taxes and management alternatives which shift more of the financial burden to producers have the potential for greater impact on low-income individuals than the population as a whole. It was estimated that in a statewide "no program" option, monetary losses to producers would be expected to increase and response time implementing PDM to address predation would increase, resulting in additional predation and increased monetary losses. Indirect consumer and producer impacts could be expected to be substantially higher. The cost effectiveness under this alternative is estimated to be lower than under the current program alternative because there would be less resources directed at applying IWDM principals to effectively resolve the conflicts and loses.

4.2.2.8 Alternative 2. Indirect and Cumulative Impacts

WS-Idaho would have no direct or indirect impacts on wildlife or ecosystems under the no federal program alternative. Indirect and cumulative impacts of all other entities under this alternative would initially be less than described for Alternative 1 because of lower levels of overall PDM, but are anticipated to reach levels similar to Alternative 1 as non-WS sources for current PDM services are identified and become established.

Non-federal entities are not required to report target or non-target take or coordinate with tribes and federal land management agencies in the same way as WS-Idaho. For these management agencies, the administrative burden associated with tracking activities of multiple private entities will exceed current levels. Consequently, reporting, consultation with land and wildlife management agencies, and program monitoring that would occur under Alternative 1 would not occur under this alternative. The lack of reporting will impair the ability of State, federal and tribal agencies to monitor and address cumulative effects on wildlife populations and ecosystems, including impacts from factors such as climate change, habitat fragmentation, and oil and gas development. Cumulative impacts would be expected to be higher under this alternative than under the current program alternative as a result of uncoordinated control actions or misapplication and unaccountability of control methods by individuals. These impacts could result in greater impacts on target and non-target wildlife and public safety, thereby affecting wildlife populations and the environment.

4.2.3 Alternative 3: Nonlethal Management Only WS-Idaho PDM Program

This alternative was discussed in Section 3.2.3. The nonlethal control only alternative is a modification of the current program alternative wherein no lethal technical assistance or direct control assistance would be provided or used by WS-Idaho. Both technical assistance and direct control assistance would be provided in the context of modified IWDM that administratively constrains WS-Idaho personnel to use nonlethal strategies to resolve wildlife damage problems.

As with Alternative 2, we would expect a temporary decline in lethal PDM services in the absence of those no longer being provided by WS-Idaho with the implementation of this alternative while systems become established to provide lethal PDM services no longer available through WS-Idaho. Individuals experiencing predator damage would still have access to nonlethal and lethal PDM methods as allowed under applicable State, federal and tribal laws. Under this alternative, aircraft and associated funding and staff would be transferred to other WS State Offices that use aircraft in their activities. The federal funding for the aerial component of the current WS-Idaho operations would not be "freed" for other WS-Idaho operational activities. Remaining federal funding for implementation of an operational program would remain the same as Alternative 1. It is unclear whether the non-WS entities that currently provide approximately 45% of the funding for PDM would continue to support WS-Idaho. Given that many livestock producers in Idaho feel that an integrated program that includes lethal methods is important for effective resolution of their conflicts, these entities may choose to allocate all funds to a different entity(ies) that could provide an fully integrated program or just assist with lethal methods not available from WS-Idaho.

All nonlethal methods would be available under this alternative. As with Alternative 2, most lethal methods would also be available to non-WS entities. The experience level of individuals conducting lethal PDM would vary. Lethal PDM methods and control devices could be applied by persons with little or no training or experience. Use of DRC-1339 for the protection of natural resources by IDFG is anticipated to continue and would be conducted in the same manner as for Alternative 1.

4.2.3.1 Alternative 3. Effects on Target Predator Species Populations

Under this alternative, WS-Idaho would be limited to using nonlethal methods. Impacts on target predator species populations under this alternative would be limited to disturbance and rare instances of unintentional mortality associated with use of live-capture systems. WS-Idaho may relocate some predators for PDM but given constraints on relocation discussed in Sections 3.2.1 (nonlethal methods), 3.3.10 and

Appendix C Section A.12, total use of relocation is low, with only limited increases under this alternative, while WS-Idaho's increase in use of nonlethal methods may result in localized shifts in distribution and activity patterns of predators, impacts on the total number of animals in state target species populations would be extremely low.

Nonlethal controls alone do not always prevent or reduce wildlife damage to acceptable levels, so other government agencies, private organizations and individuals would likely assume responsibility for implementing lethal control methods necessary to adequately deal with wildlife damage. ISADCB, by State Statue (Section 25-128, *Idaho Code*), would still have the responsibility and be required to address prevention and control of damage caused by predatory animals and other vertebrate pests. Public comments provided by counties, industry organizations and private individuals indicate that these groups feel access to lethal PDM methods is necessary to effectively reduce damage and are likely to work with other government entities or private contractors to maintain access to assistance with lethal PDM methods.

As under Alternative 2, depending on the skill and supervision of individuals using lethal PDM methods, efforts to reduce or prevent depredations could result in higher levels of take for some actions by non-WS individuals. Anticipated declines in federal and cooperator funding discussed in Section 3.2.3 would limit the extent to which WS-Idaho could provide nonlethal assistance. WS-Idaho anticipates the program would be able to provide technical assistance, but, based on costs of the Marin County California program that provided subsidies for nonlethal methods (livestock guarding animals and fencing) to address coyote predation cost an average of approximately $20,000 per year and provided assistance for only a limited number of nonlethal methods and predator species, WS-Idaho capacity to provide operational assistance would not be sufficient to meet statewide need. Increased WS-Idaho efforts to promote use of nonlethal methods could result in decreases in use of lethal methods for some cooperators. Lethal removal of predators by non-WS entities would initially decline and then is expected increase to levels somewhat below or near those of the current PDM program. As with Alternative 2, because of the lack of access to DRC-1339, lethal removal of ravens for the protection of livestock and agricultural resources would likely be slightly lower under this alternative. Anticipated use of DRC-1339 by IDFG for sage-grouse protection is expected to continue as under Alternative 1. For the same reasons shown in the population impacts analysis in Section 4.2.1.1, it is highly unlikely that coyote populations or other predators would be significantly impacted by implementation of this alternative. Impacts and possible risks of illegal chemical toxicant use under this alternative would probably be about the same as those under Alternative 2.

4.2.3.2 Alternative 3. Effects on Non-target Species Populations, Including T/E Species

Alternative 3 would not allow WS-Idaho to conduct direct operational lethal PDM. Therefore, WS-Idaho would not have any direct impact on non-target or T/E species. WS-Idaho would not conduct aerial shooting and would not impact wildlife with that method. Although technical support might lead to more selective use of control methods by private parties than that which could occur under Alternative 2, private efforts to reduce or prevent depredations could result in less experienced persons implementing control methods leading to greater take of non-target wildlife and T/E species as discussed in Section 4.2.2.2. This alternative would have the potential for increased adverse impacts resulting from WS-Idaho not providing IWDM and from the compensatory actions of private individuals. Presumably, many service recipients would become frustrated with WS-Idaho's failure to resolve their wildlife damage problem and would turn somewhere else for assistance. Higher variability in the level and scope of wildlife damage control activities could occur without a full IWDM program and this could have a greater negative effect on some local non-target wildlife species, including T/E species. Aerial shooting activities would not be used by WS-Idaho, but could be used by the private sector or ISADCB. Impacts from the use of lead ammunition are anticipated to be similar to Alternative 2 because all use of lethal methods would be conducted by non-WS entities. Even if ISADCB issued several more aerial shooting permits, the effects of low level flights from aerial shooting on wildlife and wild equines would likely be similar to those discussed in Section 4.2.1.2, barring illegal activities.

4.2.3.3 Alternative 3. Impacts on SMAs

As with lethal methods, nonlethal methods implemented or recommended by WS-Idaho would have to be approved by the land manager. Some methods such as frightening devices (light and noise devices) and night pens may be inappropriate for use in SMAs, particularly in wilderness areas. These restrictions are the same for all the alternatives, but when added to a prohibition on use of lethal methods, would substantively impact the methods available to WS-Idaho and program efficacy.

Initially, impacts on SMAs from use of lethal PDM methods is expected to decline until such time as alternative sources of lethal PDM assistance from non-WS entities are identified by the State, counties and livestock producers, at which point PDM actions are expected to reach levels similar to those occurring under Alternative 1. Impacts on SMAs under this alternative would be expected to be higher than under the current program alternative, depending on the skills of the entity conducting lethal PDM and the extent to which lethal PDM actions are coordinated with the land manager (See Section 4.2.2.3). The effects would probably be much closer to the no federal program alternative for the same reasons identified in Section 4.2.2.7.

4.2.3.4 Alternative 3. Humaneness and Ethical Perspectives

Nonlethal control techniques are generally considered more humane by animal welfare groups and many other members of the public (George et al. 2016). However, nonlethal control techniques, such as cage traps and netting, must be used in a proper fashion. For example, cage traps can be potentially inhumane if the trap is not attended to regularly and a caught animal is exposed to the elements, such as being left out in the sun or in extreme cold or hot temperatures. The effects of this alternative with regards to the issue of humaneness would be most similar to the effects under Alternative 2 because we anticipate that non-federal sources will eventually make up for lethal PDM assistance currently provided by WS-Idaho. However, these effects would not be as great under this alternative because some service recipients would be successful with nonlethal control assistance provided by WS-Idaho while others would tolerate the predator damage and not do anything about the situation. However, given that WS-Idaho already gives preference to recommending and implementing nonlethal methods where practical and effective, overall increases in use of nonlethal methods to the exclusion of lethal methods would be limited. Some WS-Idaho's service recipients may not be successful and conduct lethal controls on their own resulting in similar effects as described in Section 4.2.2.4.

WS-Idaho activities under this alternative would be more acceptable to animal rights activists and to a wider range of animal welfare advocates because WS-Idaho would not be involved in the lethal removal of predators. However, overall perception of humaneness would likely be based on incomplete information because State law does not require non-federal entities to report take of most predator species for PDM, including coyotes, the species most commonly taken. Livestock producers and others who receive services from WS-Idaho are likely to perceive this alternative as an unethical restriction of their access to legally available damage management techniques from professional, accountable WS employees. Livestock producers and others who receive services from WS-Idaho may also perceive this alternative as an imposition of additional costs of livestock production resulting in unacceptable losses. People concerned about the use of public resources to reduce damage (e.g. enhance profit) on private and public lands may find this alternative preferable to Alternative 1. However, WS-Idaho would still use federal funds for supervision, reporting and compliance with State and federal regulations.

4.2.3.5 Alternative 3. Cultural Impacts including impacts on Native American cultural uses, hunting, non-Consumptive uses, and aesthetic impacts

WS-Idaho would not impact hunting and non-consumptive uses under the nonlethal alternative. However, if individuals implement lethal control this could have adverse impacts on both the hunting and non-consumptive user groups as was discussed under Alternative 2, Section 4.2.2.4. However, the negative effects on recreation would probably be slightly less under this alternative than in Alternative 2 because Alternative 2 represents no WS-Idaho operations, but more than under the current program alternative because the current program does conduct operational actions that may, for example, include the taking of some animals that may otherwise be hunted for recreational purposes (e.g., coyotes are sometimes recreationally hunted).

Risk of adverse impacts to tribes and opportunities to work to reduce conflicts would be intermediate to Alternatives 1 and 2. Nonlethal methods often have less impact on tribal cultural practices in that they do not result in lethal removal of wildlife, but potential for impacts may occur if wildlife movement patterns and distribution shift temporarily as a result of use of some nonlethal methods (e.g., frightening devices, livestock guarding animals). WS-Idaho would be available to work with tribes to address and eliminate or minimize risks of adverse impacts that could result from WS-Idaho's use of nonlethal PDM methods.

Non-WS entities would still be able to use lethal methods. WS-Idaho would not be able to assist with consultations regarding impacts associated with the use of lethal method by non-WS entities. As with Alternative 2, State, local and private entities do not have the same obligation to work with tribes as federal agencies, and tribal opportunities to work with management agencies to reduce the risk of adverse impacts on tribal resources and culture would be diminished under this alternative. Tribal and agency access to information on what PDM activities are conducted within the ceded territories will also be limited.

4.2.3.6 Alternative 3. Impacts on Public and Pet Safety and the Environment

Most PDM methods with the potential for negative impacts on the physical environment or public safety, such as chemical toxicants, traps and snares, would not be used by WS-Idaho under this alternative. Since lethal controls would no longer be used, WS-Idaho would not have an effect on public safety. However, IDFG, ISADCB, county governments and private individuals would probably provide some level of lethal PDM assistance, but at a reduced level. As discussed in Section 4.2.1.5, the effects of these services would likely be negligible. Private individuals would increase their use of lethal PDM methods and as discussed in Alternative 2, many of these individuals would use registered toxicants incorrectly or use illegal toxicants and use of these toxicant in an incorrect or illegal manner could adversely impact the environment and public safety because improper use of toxicants places these at risk because product labels are made to prevent adverse impacts to the environment and public safety because that is important. In addition, traps, snares and firearms used by novices could have adverse effects on public safety and the environment as discussed in 4.2.2.5. WS-Idaho's nonlethal PDM activities would not be likely to have a negative effect on the public concerning "environmental justice and Executive Order 12898" issues. WS-Idaho would not be able to respond to predator complaints with lethal PDM for incidents involving human health and safety. As with Alternative 2, aerial shooting would probably be greatly reduced under this alternative because it requires pilots with experience at low level flying and a permit from ISADCB. Even if ISADCB increased the issuance of permits, impacts are not likely to be greater than those analyzed for Alternative 1 because that potential increase in permits issued is likely to be minimal. The reduction in aerial shooting would result in an increase in the amount of ground traffic and hours of PDM required for an equivalent level of predation management (Wagner and Conover 1999). This increase in PDM activity on the ground would increase the risk of damage to the environment from vehicular traffic and increase the likelihood of a conflict between PDM and recreational activities.

4.2.3.7 Alternative 3. Cost Effectiveness

Livestock losses would most likely be greater than in the current program. Nonlethal PDM methods are extremely limited for some applications (e.g., predation on range herds of cattle), and, in some cases, predation persists despite implementation of practical and effective nonlethal methods. If this alternative were implemented, WS-Idaho would be unable to provide operational assistance for producers with conflicts that could not be addressed through the subsidy program. In some instances of threats to human health and safety, prompt removal of the individual animal involved in the incident may be the most appropriate response, but, under this alternative, that assistance would have to be provided by an entity other than WS.

Depending on the services provided by the program, the direct federal costs to fully implement this alternative could be higher than the current program depending on the services provided. In FY 2015, WS-Idaho spent approximately $1,194,500 on PDM (excludes wolf damage management). If this alternative is selected, federal funding currently used for aircraft and pilots ($467,400) would be reallocated by the WS Regional Office to other states that still implement aerial programs. Continued funding from cooperators is uncertain. Cooperators currently provide approximately 42% of the funding for PDM by WS-Idaho. Based on comments received from livestock producers and producer organizations, these entities clearly believe that a fully integrated PDM program including use of nonlethal and lethal methods is needed to address predation. If WS-Idaho selects this alternative, the State and local agencies may re-allocate funds from WS to other sources that could provide assistance with a full suite of PDM methods. Nonetheless, if cooperator funding is retained and assuming that other staffing costs ($555,600) and vehicle costs ($103,500) remain the same for conducting damage verification and educational seminars, approximately $68,000 would remain available to subsidize nonlethal PDM supplies. For context, a program in Marin County, CA that provides subsidies for nonlethal methods (livestock guarding animals and fencing) to address coyote predation cost an average of approximately $20,000 per year for the period of FY 2012-13 and FY 2013-14 (Marin County, CA, 2014, unpub. data). The program caps assistance for producers with 299 sheep and goats or less at ($1,500 per year) and flocks of 300 or more animals at $3,000 per year. After acquisition of a livestock guarding animal, yearly maintenance assistance of up to $350 per dog and $200 per llama is also available. If subsidy costs per county in Idaho were similar, the funds currently available to WS-Idaho for operational PDM would cover subsidy costs for approximately 3.5 counties and would be insufficient to address statewide needs. In actuality, costs in Idaho would likely be higher because there is a need to address a wider range of predator conflicts and predator species than in the Marin County program.

Unless substantial increases in funding are obtained for the WS-Idaho program, most support provided by WS-Idaho would primarily be limited to technical assistance. Livestock owners would likely have to absorb the cost of hiring private control agents or conduct lethal PDM themselves. As with Alternative 2, options which switch an increasing proportion of PDM costs to producers are likely to have a disproportionate impact on low-income producers and property owners.

4.2.3.8 Alternative 3. Indirect and Cumulative Impacts

Indirect impacts of WS-Idaho's activities under the nonlethal control only alternative would be substantially lower than Alternative 1 and be primarily associated with displacement of wildlife associated with increased use of fencing, frightening devices, and livestock guarding animals. Increases in the use of livestock guarding dogs may also increase the risk of guarding dogs preying on native wildlife. WS-Idaho's active participation in promoting use of nonlethal methods could result in some local increases in effective use of nonlethal methods and associated declines in use of lethal techniques. Positive contributions to the local economy would be expected to be lower than Alternative 1 and similar to the no federal program alternative because resource (livestock and game species) losses are expected to be higher as discussed in Section 4.2.2.6.

As with Alternative 2, cumulative impacts would be expected to be higher under this alternative than under the current program alternative as a result of uncoordinated control actions or misapplication of control methods by individuals. These impacts could result in higher impacts on non-target wildlife and public safety, thereby negatively affecting wildlife populations and the environment. The effects of predator removal on prey populations would be similar to that discussed in Section 4.2.2.8.

4.2.4 Alternative 4: Nonlethal Required before Lethal Control

This alternative would require that: 1) livestock grazing permittees, landowners or resource managers show evidence of sustained and ongoing use of nonlethal or husbandry techniques aimed at preventing or reducing predation prior to receiving operational services from WS-

Idaho; 2) employees of WS-Idaho use or recommend use of appropriate nonlethal techniques in response to a confirmed damage situation prior to using lethal methods; and, 3) lethal techniques be used only when the use of husbandry or nonlethal techniques had failed to keep livestock losses below an acceptable level as indicated by the person experiencing the predation. No lethal preventive predation management would occur under this alternative. Producers and the general public would still have the option of implementing lethal control measures on their own and WS-Idaho would continue to recommend nonlethal and lethal control when and where appropriate.

4.2.4.1 Alternative 4. Effects on Target Predator Populations

Under this alternative, WS-Idaho removal of target predator species would probably be somewhat less than that of the proposed alternative (Alternative 5) because lethal actions would be restricted to situations where the requestor or WS-Idaho had attempted nonlethal controls with no success. WS-Idaho would not conduct proactive lethal removal of coyotes, so take of coyotes for PDM is likely to be substantially lower in the first years of this program. However, given that there are currently 19 non-WS entities with licenses to hunt from aircraft, and that shooting from aircraft is the primary method used for lethal preventive predation management of coyotes, take for preventive predation management by non-WS entities could potentially reach levels similar to WS-Idaho's use of this method.

For many individual damage situations, this alternative would be similar to the current program (Alternative 1) because many producers, prior to contacting WS-Idaho, have attempted one or more nonlethal methods such as predator resistant fencing or livestock guarding animals, as described in Appendix C, without success, or have considered them and found them to be impractical in their particular situations. For the same reasons shown in the population impacts analysis in Section 4.2.1.1, it is highly unlikely that coyote or other predator populations would be significantly affected by implementation of this alternative. Impacts and potential risks from illegal chemical toxicant use under this alternative would probably be similar to Alternative 1. Any reductions in targeted wildlife by WS-Idaho as a result of this alternative would have no major adverse impacts to the species involved or Idaho's statewide population. Virtually all of the livestock producers cooperating with WS-Idaho are implementing nonlethal measures (Appendix C) on their own (e.g., among many other measures, sheep producers with large range bands in Idaho typically utilize herders and/or guarding dogs, cattle producers in Idaho commonly utilize various animal husbandry strategies including carcass retrieval, and/or selective use of range and timing season and location of calving to minimize risk of predation); therefore, the effects on target species populations would probably be similar to that described under the current program (Alternative 1).

4.2.4.2 Alternative 4. Effects on Non-target Species Populations, Including T/E Species

In the absence of lethal preventive predation management of coyotes, the amount of corrective predation management is likely to increase. Aerial shooting is the primary method used for preventive coyote predation management and is highly selective to target species. Under this alternative, in areas where shooting from aircraft would normally be used for preventive predation management, subsequent risks to non-target species may increase, because corrective predation management tends to make greater use of traps and snares (Wagner and Conover 1999). WS-Idaho SOPs to avoid T/E impacts were described in Chapter 3 and they would ensure that adverse impacts from expected greater use of traps and snares by WS-Idaho are not likely to occur to T/E species by implementing Alternative 4.

The nonlethal before lethal control alternative would not consistently allow WS-Idaho to respond to wildlife threats quickly or adequately. If cooperators become frustrated by WS-Idaho's response to depredations by always starting with nonlethal strategies, they may be likely to seek private services to reduce or prevent further depredations which often is performed at reduced efficacy than described in Alternatives 2 and 3. The impacts of non-WS entities implementing PDM would be similar to those described in Alternatives 2 and 3.

4.2.4.3 Alternative 4. Impacts on SMAs

Impacts on SMAs under this alternative would be similar to the current program (Alternative 1) except there would be no use of preventive coyote predation management or other preventive predation management. The decline could reduce impacts of aircraft on SMAs, but may result in increased use of traps and snares as discussed under Section 4.2.4.3. Preventive predation management could still be conducted by private entities in most areas in the absence of WS-Idaho. Some nonlethal methods may be unsuitable for use in some SMAs, particularly wilderness areas (e.g., frightening devices that produce noise and lights, temporary night pens). Although the effectiveness of stopping or reducing predation may not be as high as the current program (Alternative 1), this alternative would allow the use of all methods eventually. Producers would be less inclined to impact SMAs since coordinated assistance would still be available.

4.2.4.4 Alternative 4. Humaneness and Ethical Perspectives

The amount of suffering by target and non-target wildlife under this alternative would initially be less than under the proposed alternative because fewer animals would be taken if proactive lethal removal of coyotes by WS-Idaho would not be allowed. However, given the number of private permits for aerial shooting, use of aircraft for lethal preventive predation management is eventually anticipated to reach levels similar to WS-Idaho. Private individuals would also increase their use of foothold traps, snares and shooting for preventive control activities where producers feel WS-Idaho could not resolve a damage problem in a timely manner because nonlethal control measures needed to be implemented first. Lack of preventive predation management with aerial shooting may also result in increases in WS-Idaho use of traps and snares for corrective PDM and associated risks to non-target species. Suffering of livestock because of injuries caused by predation would likely increase under this alternative because PDM actions by WS-Idaho could not be implemented until after the onset of depredation and after nonlethal methods could not solve the problem.

Alternative 4 would still be unacceptable to animal rights advocates and too many individuals because it permits lethal removal of predators and because of the risks associated with likely increases in the use of traps and snares. However, a larger number of animal welfare advocates would find this alternative more acceptable than the current program (Alternative 1) because it provides an assurance that predators would not be killed unless a nonlethal alternative has been tried. Livestock producers may perceive this alternative as an unjustified imposition on them of additional costs of production and potentially, additional losses on resource owners may be borne because most livestock producers already implement some form of nonlethal protective measures and need assistance when those measures have failed. Individuals concerned about the use of public resources to enhance private profit are unlikely to perceive this alternative as an improvement over Alternative 1 because it still may involve the deployment of lethal strategies to resolve the conflicts.

4.2.4.5 Alternative 4. Cultural Impacts including impacts on Native American cultural uses, hunting, non-consumptive uses, and aesthetic impacts

WS-Idaho would minimally affect recreationists with the nonlethal before lethal PDM alternative. In areas where nonlethal control had already been implemented and found to be unsatisfactory, the full array of PDM methods could be used and their effects were considered minimal as discussed in Section 4.2.1.5. However, some private individuals would implement lethal control on their own because WS-Idaho might seem unresponsive. This could have significant adverse effects on recreationists as discussed for Alternatives 2 and 3. However, the effects on recreationists as a result of implementation of Alternative 4 would probably be less than Alternatives 2 and 3 because of the greater likelihood of dependency by livestock producers to utilize private sector services to resolve their depredation conflicts under these alternatives, but more than the effects discussed for Alternatives 1 and 5 because of less dependence on these private sector services to resolve depredation conflicts under these alternatives.

Opportunities for consultation and coordination with the tribes and resultant reductions in risks to tribal spiritual, cultural and economic resources would be similar to

Alternative 1. This alternative may be preferable to tribal members because it offers added assurance that nonlethal methods will be attempted prior to use of lethal methods and because no proactive PDM would be conducted. Some private individuals may seek to conduct lethal PDM on their own instead of working within the restrictions on WS-Idaho assistance. Impacts to tribes from the actions of private individuals and tribal access to recourse for adverse impacts resulting from actions of non-WS entities would be as described under Alternative 2, because they do not have the same obligations to consult with the tribes as WS. However, because most private individuals that cooperate with WS-Idaho already use nonlethal methods, instances of this type of impact are likely to be limited.

4.2.4.6 Alternative 4. Impacts on Public and Pet Safety and the Environment

WS-Idaho would not have an adverse effect on public safety, the environment or the public concerning "environmental justice and Executive Order 12898." Risks to pets would be low for the reasons noted under Alternative 1, but slightly higher than Alternative 1 because of likely increases in the use of traps and snares. Because WS-Idaho could not necessarily resolve problems in a timely manner, some cooperators would resort to tactics described in Section 4.2.2.5. If private individuals conduct lethal PDM without federal oversight, effects on public safety and the environment under this alternative would be greater than the current program alternative (Alternative 1) because of the greater likelihood of dependency by livestock producers to utilize private sector services to resolve their depredation conflicts under this alternative, but less than the nonlethal control only alternative (Alternative 3) because of the dependency by livestock producers to utilize private sector services to resolve their depredation conflicts under this alternative would be less than Alternative 3.

4.2.4.7 Alternative 4. Cost Effectiveness

The cost effectiveness of requiring the use of nonlethal methods before implementation of lethal methods would be low in situations where they are not effective and resource losses are allowed to continue. The full array of management tools would be available, but nonlethal methods would be used first, regardless of whether or not they were determined to be the most effective or appropriate choice using the WS Decision Model (Slate et al. 1992, WS Directive 2.201). Thus, the use of nonlethal methods first may delay effective wildlife damage management and the protection of livestock, property and human health and safety. The current program (Alternative 1) uses or recommends nonlethal methods in instances in which they are considered likely to be effective. Mandating nonlethal methods as a first option when they are unlikely to resolve a damage situation would reduce the effectiveness of PDM. Under the IWDM approach, WS-Idaho always considers if nonlethal methods would be effective before contemplating the use of lethal methods. Therefore, this alternative would be more costly because it does not consider cost effectiveness in its initial response to resolve the damage and, thereby would also be less effective than the current program (Alternative 1), but more effective than the no federal program alternative (Alternative 2) and nonlethal only alternative (Alternative 3) because these latter two alternatives do not consider half of the IWDM philosophy in resolving these conflicts.

4.2.4.8 Alternative 4. Indirect and Cumulative Impacts

Indirect impacts of WS-Idaho actions under this alternative are anticipated to be similar to or slightly higher than Alternative 1. In areas where non-WS entities conduct lethal PDM because of objections to WS-Idaho and where non-WS entities will be able to conduct preventive lethal PDM that would otherwise be conducted by WS-Idaho under Alternative 1, risks of adverse indirect impacts on non-target species would be similar to or slightly greater than Alternative 1. To elaborate, this alternative does not fully utilize the IWDM philosophy in its initial response to resolve the damage. Therefore, it would inherently be less effective than the current program (Alternative 1) in resolving the conflicts. This would likely result in more utilization of private sector services by livestock producers to more immediately respond to identified threats and damage, which is likely to cause this alternative to have greater indirect and cumulative impacts.

Cumulative impacts on target and non-target species would be expected to be greater than the current program (Alternative 1), because individuals who find this alternative unacceptable would be more likely to implement their own lethal control actions without waiting for nonlethal methods to be attempted first. However, risks of this type of behavior would be lower than for Alternatives 2 and 3 because these two alternatives do not contain any provisions of lethal PDM to resolve the identified conflict, therefore, WS-Idaho services are far less likely to be considered in lieu of private sector services that are far less regulated than that of the WS-Idaho services. Therefore, the cumulative impacts of this alternative is anticipated to be less than that of Alternatives 2 and 3. Impacts of implementing Alternative 4 on prey species populations would not likely differ much from those of the proposed action for the same reasons identified in Section 4.2.3.1.

4.2.5 Alternative 5: Modified Current Federal WS-Idaho PDM Program (Proposed Alternative)

This alternative would be identical to Alternative 1 in all respects except that efforts to manage damage associated with predation on species such as sage-grouse, ducks, and big game such as bighorn sheep, pronghorn antelope and mule deer could increase.

4.2.5.1 Alternative 5. Effects on Target Predator Species Populations

The effects on most target species by WS-Idaho would be very similar to the current program (Alternative 1) because any program emphasis of game species protection over livestock protection would be likely to take a similar number of predators as anticipated under the maximum for Alternative 1, with the exception of ravens. If WS-Idaho becomes involved with raven removal to reduce predation on sage-grouse or Columbian sharp-tailed grouse nests and young, the number of ravens killed per year will increase, but probably by not more than 1,750 ravens (the number of ravens listed on the IDFG permit for the sage-grouse protection study). This increase in raven take by WS-Idaho would replace the anticipated take of ravens by IDFG analyzed in the review of cumulative impacts on the raven population in Alternative 1. Consequently, even though take of ravens by WS-Idaho would increase under this alternative cumulative impacts on the raven population are likely to be similar between Alternatives 1 and 5.

WS-Idaho will not be involved in raven control to reduce predation on sage-grouse or Columbian sharp-tailed grouse nests and young without a direct request for assistance and authority from the appropriate wildlife management agency. Currently sage-grouse are classified by the IDFG as a game bird and IDFG has full management authority. Should sage-grouse become federally listed, then the USFWS will assume full management authority, but will most likely work very closely with IDFG biologists.

If WS-Idaho receives a request to conduct raven control, any raven in the proposed area would be considered a target bird and potential predator on sage-grouse or Columbian sharp-tailed grouse eggs and young. WS-Idaho would rely on the use of DRC-1339 treated egg baits as the primary method of control. Individual ravens that consume the treated egg baits are also highly likely to prey on sage-grouse eggs, making this type of PDM tool very selective for those individuals who feed on bird eggs. Other studies have identified badgers, coyotes, crows, magpies, red foxes and striped skunks as predators on sage-grouse eggs and young. Should crows, magpies or mammalian predators be targeted for removal, the numbers taken would be very low, within the estimated maximum numbers analyzed for Alternative 1 and therefore, indirect effects and cumulative impacts would be within the parameters analyzed under Alternative 1 resulting in a low magnitude of impact on target species' populations.

WS-Idaho is aware that there are concerns that this alternative could adversely impact the genetic makeup of the raven population. This alternative will not eliminate ravens locally or statewide, but is intended to reduce the local populations to levels more consistent with levels which may have occurred prior to human development. Ravens in Idaho are not migrants so new animals in the population are anticipated to be immigrants from the surrounding area and offspring of the birds remaining in the population. Neither group is anticipated to be substantially different in genetic makeup than the current population. Genetic studies have shown that despite a general lack of readily apparent physiological or behavioral differences, there are two distinct genetic groups in common ravens (Webb et al. 2011, Omland et al. 2000). One group, the “California clade”, is mostly concentrated in southern California. The second group, the “Holarctic clade”, consists of common ravens from Maine, Minnesota, New Mexico, Alaska, France, European Russia, Siberia and Mongolia. Representatives of both clades have been found mixed within the same populations in multiple locations sampled in the western U.S., including northern California, Nevada, Idaho and Washington State (Webb et al. 2011). In Idaho, genetic sequences of 12 common ravens sampled from the same county indicated 7 were from the California clade and 5 were from the Holarctic clade. Some authors have proposed reclassification of the California and Holarctic clades as separate species (Navarro-Sigüenza and Peterson 2004, McKay and Zink 2010). However, an intensive study of birds from both haplotypes in a common raven population in the Olympic Peninsula of Washington determined that mate pairings were random and there was no evidence of preference for individuals from the same clade, nor were there differences in reproductive success among birds from single-clade or mixed-clade pairs (Webb et al. 2011). There was also no difference in survival or resource use among clades or in morphological or behavioral characters, except that one clade had a slight tendency toward greater mobility. The authors concluded that in the absence of barriers to gene flow, differences in phenotypic characteristics, simple geographic boundaries between clades or fitness effects of cross-clade mating, that the genetic differences were likely a result of past isolation and that the two clades should not be characterized as separate species (Webb et al. 2011).

The cumulative four-year average mortality of ravens in Idaho from all sources is estimated at 182.5 birds (Table 4.16) which represents 0.36% of the population estimate of 50,000 and 0.88% of the minimum estimated post-fledging population (*n*=20,750). Under this alternative, future WS-Idaho annual raven take (for all projects) is not expected to be over 2,300 ravens or 3.8% of the estimated raven population. Using the following data on ravens in Idaho: 1) four-year average number of known mortality of ravens by sources other than WS-Idaho (*n*=41); 2) maximum number of ravens in any one given year that WS-Idaho would kill in Alternative 1 (*n*=500); and, 3) maximum number of ravens that WS-Idaho would expect to kill in any one given year under known IDFG raven management plan (*n*=1,750), WS-Idaho anticipates that the maximum annual cumulative take is approximately 2,291 ravens or <4.6% of Idaho’s estimated population. Given a reproduction rate of 3.4% per year from 1966 to 2012 data (equivalent to approximately 1,700 raven being recruited to the population each year) and a maximum annual cumulative mortality of 2,291 ravens, the number of ravens removed by WS-Idaho through this alternative would only result in an overall reduction of the raven population by <600 ravens, or 1.2% of the estimated population. Assuming that known cumulative human-caused raven mortality (Table

4.16) is additive to all other sources of mortality, raven take of 2,291 birds would result in a little more than the annual population increase from reproduction.

If raven mortality is in some part compensatory to other forms of mortality (i.e., some of the ravens killed by WS-Idaho would have died anyway from other causes) then the Idaho raven population would continue to increase, but at a rate lower than Alternative 1. During WS-Idaho PDM activities to protect livestock from raven predation, many of those ravens are from flocks of "floaters." These birds are young birds without breeding territories. Data from Webb et al. (2004) indicates that first year birds have much lower survival than older birds. In other wildlife populations with high mortality rates for young non-territorial individuals, human-caused mortality is often compensatory to other forms of mortality and it seems likely that this would also be true for ravens. Therefore, if cumulative human-caused mortality is compensatory to even a small degree, then the raven population would probably stabilize or increase slightly annually, despite WS-Idaho killing 2,291 ravens annually. If WS-Idaho caused raven mortality is compensatory to a higher level than other raven mortality, then the population would be expected to continue to increase. Ravens killed would leave a temporary void, but would eventually be replaced by other ravens immigrating to that area. Given this analysis and the research and monitoring, WS-Idaho concludes that this alternative will have a low to moderate impact on the Idaho raven population.

Some of the ravens in Idaho may be migrants, especially some of the birds in the large winter flocks (Boarman and Heinrich 1999). Therefore, we are considering known raven mortality and trends in populations for States adjacent to Idaho (Montana, Nevada, Oregon, Utah, Washington and Wyoming) to evaluate direct effects and cumulative impacts. Table 4.17 provides mortality data and cumulative impacts of ravens for these States. Data from the Partners in Flight Science Committee (2015) indicate that the seven-State region combined estimated population is 622,000 ravens with an average population increase of 3.3% per year, which adds 20,526 ravens to the population every year. When the average annual number of ravens killed by WS programs in the seven-States region (*n*=7,212.5) and the average annual known mortalities (*n*=416.75) are combined (*n*=7,629.25) and assuming that these mortalities are additive mortality, the resulting raven population would continue to increase, indicating that WS' cumulative annual raven removal is having a very low impact on the raven population in the seven-State area. And if these mortalities are partially or totally compensatory, then WS annual average removal of 7,212.5 ravens is having very little to no impact on the seven-State population. Ravens killed would leave a temporary void in the general area where they were removed, but the areas would eventually be replaced by other ravens immigrating to that area. It is not anticipated that this alternative will have any major indirect effects to Idaho's or the regional raven populations, other than those already mentioned in the paragraphs above.

The direct and cumulative impacts of the proposed action are not expected to adversely impact the viability of the State or regional raven populations although local reductions in raven numbers will occur at the project sites. Similarly with coyotes possibly controlled to protect ducks and big game species, the number of individual animals removed would remain within the low magnitude range and would not contribute towards the decline of either of these species populations.

4.2.5.2 Alternative 5. Effects on Non-target Species Populations, Including T/E Species

The effects of the proposed alternative on non-target species populations and on T/E species would be very similar to the current program (Alternative 1) because the work being proposed is work that has already been done, just potentially a little more individual and localized projects. However, should WS-Idaho become involved with raven depredation management to reduce predation on nests and young, WS-Idaho's activities could increase effects on some non-target species, particularly egg-eating birds, such as magpies. Methods used by WS-Idaho to remove ravens would be DRC-1339 on egg baits, shooting and raven nest destruction.

Risks from increased use of DRC-1339 for raven control

Details of risks to non-target species from DRC-1339 egg baits are described in Section 4.2.1.2 above. Under this alternative, in localized areas of concern and for brief portions of the year, there could be an increase in the use of DRC-1339 egg baits. There would be no other change in the use of DRC-1339.

Bentz et al. (2007) reports that secondary toxicity hazards of DRC-1339 to predators or scavengers are low because the chemical is metabolized and its non-toxic metabolites are excreted within a few hours after ingesting the treated bait. DRC-1339 also degrades rapidly when exposed to moisture, sunlight, heat or UV radiation (Tawara et al. 1996). Bentz et al. (2007) reports that DRC-1339 is environmentally safe in that it binds tightly to soils, has low mobility, degrades rapidly and will not migrate. The useful life of DRC-1339 can vary between a couple of hours when under high humidity and sunlight to more than a week under dark, dry conditions (Bentz et al. 2007). The half-life of DRC-1339 in biologically active soil is about 25 hours and identified metabolites have low toxicity. Because DRC-1339 degrades rapidly in soils, does not persist and binds tightly to soils, it is unlikely that DRC-1339 is translocated into plants (APHIS 2001). Pre-baiting with non-treated eggs is one technique used to reduce the exposure to non-target animals. Pre-baiting is required by the DRC- 1339 pesticide label to 1) promote feeding by the ravens and magpies, 2) facilitate monitoring target species' numbers, and 3) assess potential for exposure of non-target species. Non-treated, hard boiled chicken eggs are used for pre-baiting. To asses for terrestrial and nocturnal non-targets, such as coyotes, badgers, snakes, skunks, etc., the pre-baited site where untreated eggs are placed is thoroughly inspected for animal tracks or sign before and after the eggs are placed. If pre-baiting determines that non-target exposure is likely, then WS-Idaho will abandon that application site for placement of treated egg baits. If non-targets are attracted to the pre-baited eggs and there is evidence that the eggs have been pecked-on, consumed or been carried off, then that potential application site also will not be used.

The use of elevated platforms may help reduce potential exposure to non-targets, such as snakes or small mammals. Heinrich (1988) reports that some ravens can be highly neophobic which could result in ravens rejecting egg baits. It is not expected that elevated platforms will be used very often and if platforms are suspected as attracting other non-target species, such as raptors and non-target corvids, then the platform will be removed and use discontinued. The pesticide label also requires the applicator to observe the site for evidence of non-target activity before placement of treated egg baits. The observations will help determine flight patterns and paths and communal roost sites of ravens or magpies. Again, if non-target species are seen and the applicator determines that non-target exposure is likely, then that application site will not be used for placement of treated egg baits. Other ways WS-Idaho will implement to minimize and avoid exposure to non-targets is by collecting unconsumed treated egg baits within no later than seven days after placement and by placing no more than two eggs at any one application site and any one time. This technique is recommended in Bentz et al. (2007) in that it limits bait exposure on bait sites, thus reducing exposure to non-targets. Collected egg baits will be disposed of by burning or burial. Treated egg baits will only be placed at sites that ravens or magpies are actively using or where those birds are actually observed in the area. According to records for the past eight years, WS-Idaho has applied approximately 1,300 DRC-1339 treated egg baits on 11 different projects and no non-target species have ever been known to have been exposed to, consume DRC-1339 treated eggs, have died from eating DRC-1339 treated eggs or have died from secondary poisoning.

Coats et al. (2007) reports that videography used in the last two years of a four-year field study, documented that 14 DRC-1339 treated eggs were totally consumed by Wyoming ground squirrels, Piute ground squirrels consumed three treated eggs, great basin pocket mice consumed one treated egg and American magpies consumed two treated eggs. Domestic cattle consumed two untreated eggs. A total of 5,280 treated eggs were placed during this two-year period, but not all treatment sites were video recorded. It is important to note that videography did not capture any non-target species that are known to be at risk of fatality from DRC-1339 effects consuming egg baits (Coates et al. 2007). However, ground squirrels, which are not known to be vulnerable to the dosage of DRC-1339 injected into the eggs, were commonly observed consuming eggs. Ground squirrel LD_{50} value has not been described, but reported values of other rodents are relatively high (having a high tolerance). For example, mouse and white rat LD_{50} value was reported as 2,000 and 1,170-1,770 mg/kg, respectively (Hyngstrom et al 1994). LD_{50} value for ravens is 5.62 mg/kg (Schafer et al. 1983) and black-billed magpies is 5.6 to 17.7 mg/kg (DeCino et al. 1966), which means that mice and white rats (rodents) have a significant higher tolerance to DRC-1339. In evaluating the threat of DRC-1339 treated eggs to ground squirrels, white rats will be used for the comparison since they are similar size and weight of a Wyoming ground squirrel as described in Coates et al. (2007). The LD_{50} value for white rats (1,170 mg/kg) will be used since it is the lesser of the two rodent species and a more conservative value for this exercise. In order for an adult white rat, weighing 454 grams (1 pound), to receive an LD_{50} dosage, a single rat would have to eat 129 treated eggs. The average weight of a large, hard-boiled chicken egg is about 57 grams. A white rat would have to eat 7,353 grams or 16.2 pounds of eggs in order to receive an LD_{50} dosage of DRC-1339 and because DRC-1339 metabolizes very quickly, consuming this many eggs while still viable is biologically impossible. Besides, the number of treated eggs placed per square mile (640 acres) for the protection of sage-grouse nests will most likely never exceed 14 at any one time. So in order for a one-pound white rat to receive an LD_{50} dose of DRC-1339, it would have to locate and eat all treated eggs that are placed in a nine square mile area…which is impossible. In Coates et al. (2007) study, the authors reported that the initial week of treatment following pre-baiting may have resulted in high raven take, but prolonged treatment did not appear to continue to remove ravens at high rates throughout the treatment period.

WS-Idaho completed Section 7 consultation in 2014 with the USFWS to assess the impacts of all DRC-1339 products, including treated egg baits, to grizzly bears, Selkirk Mountain woodland caribou, Canada lynx, North American wolverine and northern and southern Idaho ground squirrels and updated the consultation in 2016 (this consultation excluded the wolverine because it was temporarily delisted until just recently). A “no effect” determination was made by WS-Idaho for all species because; 1) the pesticide label prohibits its use in areas where the product may be consumed by endangered species, and, 2) mammals, in general, have a high tolerance to DRC-1339 (i.e., LD_{50} for white rats is 1,170-1,770 mg/kg. White rats were used in comparison with Idaho ground squirrel due to similar size and weight). The USFWS informal consultation concurred with that determination (USFWS 2014). To provide additional protections for Idaho ground squirrels, WS-Idaho proposed to the USFWS that treated egg baits will not be placed within 500m of known southern Idaho ground squirrel colonies. This same restriction will also be applied to known colonies of northern Idaho ground squirrels.

The public has also raised concerns about secondary poisoning of DRC-1339 treated egg baits, including soil and aquatic microorganisms, which might feed on poisoned-laced chicken eggs that have broken or contents spilled on the ground. DeCino et al. (1966) fed a diet of starlings that had been killed with an estimated one to three lethal doses of DRC-1339 to a Cooper’s hawk, a northern harrier and an American kestrel during a three- and four-month period. The Cooper's hawk consumed 222 starlings, the northern harrier consumed 191 starlings and the American kestrel consumed 60 starlings during the testing period. At the conclusion of the feeding trial, none of the raptors showed any ill effects and all gained weight. Cunningham et al. (1979) estimated that a sensitive species (i.e. cat, owl and magpies) could be at risk only if its diet consisted wholly of DRC-1339-poisoned starlings for more than 30 continuous days; however, risk is minimal because use and exposure to bird carcasses occurs for just under two weeks (Bentz et al. 2007). Secondary poisoning risks are discountable to non-target animals, including avian scavengers (Cunningham et al. 1979, Schafer 1984, Knittle et al. 1990) because of DRC-1339's rapid metabolism. Metabolism studies have shown that as much as 90% of a dose of DRC-1339 administered to birds is excreted in the form of parent compound or metabolite within 30 minutes (Apostolou 1969, Apostolou and Peoples 1971, Mull 1971, Giri et al. 1976). Goldade et al (2004) observed that when DRC-1339 was administered to dark-eyed junkos and red-winged blackbirds most of the radioactively marked DRC-1339 and metabolites had been excreted 4 hours after ingesting the bait (blackbirds - 85% excreted; junkos – 91% excreted). Bentz et al. (2007) reported that DRC-1339 is considered non-hazardous to predators or scavengers since the chemical is metabolized and its non-toxic metabolites are excreted within a few hours soon after ingesting the treated bait. Prior to 1979, no cases of secondary poisoning by DRC-1339 of raptors or mammals have been observed (Cunningham et al. 1979). Since that time, a crow was killed from secondary poisoning with DRC-1339, though, when it scavenged the gut contents of a recently treated pigeon during a grain-bait application, rather than egg bait (APHIS 2001).

There were reports discussed in the 1995[23] and 1998 Biological Opinions issued on research projects conducted by NWRC that a peregrine falcon was killed via secondary toxicity after eating pigeons poisoned with DRC-1339. However, subsequent review of the information in the North Dakota 1998 Biological Opinion by WS indicates that the Biological Opinion may have overstated the situation with the peregrine falcon. A conversation was conducted with the United States Geological Survey's National Wildlife Health Center (NWHC) in Madison, Wisconsin, which conducted the necropsy on the peregrine falcon. NWRC records indicate that in 1993, a peregrine falcon was observed feeding on pigeons in Porter County, Indiana and was later found disoriented (T. Pugh, WS, pers. comm.). There was no further background information submitted with the bird. There is conflicting information between the record of the conversation with the NWHC and the material submitted in the 1995 and 1998 Biological Opinions. The conversation record with the NWHC indicates no information was provided on pesticide use in the project area and that the person that submitted the bird for evaluation suggested testing for a different avian toxicant, Avitrol. In contrast, the Biological Opinion cites an individual as stating that the site was baited with DRC-1339 for starlings. NWHC tests for Avitrol on the bird carcass were negative, but the bird had widespread kidney

[23] WS was unable to obtain a copy of the 1995 opinion, however its content was referenced in the 1998 opinion.

damage. The NWHC noted that whenever kidney damage is observed it raises the issue of Starlicide™ poisoning (Starlicide™ has the same active ingredient as DRC-1339 and is available to registered pesticide applicators – not just WS). Starlicide causes specific types of damage to the kidney and almost always causes visceral gout. Further testing of the kidney was impossible due to its poor condition caused by post-mortem necrosis and freezing. Visceral gout was not present, which is expected with Starlicide poisoning and this was noted in the necropsy report. The lack of visceral gout tends to suggest Starlicide was not the cause of death.

Secondary poisoning has not been observed with DRC-1339 treated egg baits. DRC-1339 is highly toxic to aquatic invertebrates. Concerns regarding water micro-organisms are discountable because the pesticide label prohibits the application of egg baits within 50 feet of permanent manmade or natural bodies of water, unless baited sites are under constant observation while baits are exposed. To prevent problems with runoff due to high rainfall events, label directions state: 1) **do not** apply when runoff is likely to occur; 2) **do not** apply directly to water, or to areas where surface water is present, or to intertidal areas below the mean high water mark; and, 3) **do not** contaminate water by the cleaning of equipment or disposal of waste.

In addition to secondary poisoning, some members of the public are concerned about tertiary poisoning from DRC-1339 (tertiary poisoning is defined as a scavenger/predator dying after eating a prey item that fed on the carcass of a bird that died from direct poisoning of DRC-1339). In addition to the explanations provided in regarding secondary poisoning, it is extremely unlikely that any effects would occur to an animal that would kill and consume or scavenge on an animal that fed on another animal that fed on an animal that ingested DRC-1339 or had died from secondary poisoning, simply because of the unlikelihood of secondary poisoning ever occurring.

Food caching behavior by corvids has been documented and studied by James and Verbeek (1983), Balda and Kamil (1989), Kamil et al. (1993) and Waite and Reeve (1995) and ravens cache food by hauling it away, burying it in secret locations and eating it later. Heinrich and Pepper (1998) conducted laboratory tests on the food caching behavior of ravens and they found that when the ravens were given only enough food for a single individual to control, caching was greatly delayed. A behavioral strategy for ravens when caching food is to bury it or hide it from the sight of other ravens or corvids to decrease detection and robbery. Because of this concealment, the likelihood of other birds and scavengers locating the cache is minimal and the fact that the toxicity of DRC- 1339 treated eggs significantly diminishes within three to four days, the threat of non-target animals finding and eating treated egg baits is negligible. The widely dispersed placement of eggs (the number of treated eggs placed per square mile (640 acres) will most likely never exceed 14 at any one time) and the placement of only 2 eggs per "set" increases the likelihood that ravens will eat the eggs instead of caching the eggs. However, if

WS-Idaho field employees observe caching behavior by ravens then the placement of treated egg baits in that area will be reduced or terminated.

Some individuals have expressed concern that ravens caching DRC-1339 treated eggs could drop eggs in-route to cache sites in water supplies and contaminate water with DRC-1339. As noted above, WS-Idaho's application strategy for egg baits and pre-treatment monitoring substantially reduces egg caching behavior. In order for the incident noted by commenter to occur, a raven would have to try to cache an egg, drop the egg in process, and happen to drop the egg in a water supply. Probability of this type of occurrence is extremely low as is likelihood of toxicity. DRC-1339 degrades rapidly in anaerobic and aerobic environments, including the inside of an egg. DRC-1339 photodegrades in water with a half-life of 4.1 to 41 hours (USDA 2001b). Fish appear to have low sensitivity to DRC-1339 but some aquatic invertebrates could be adversely affected (USDA 2001b). However, given the very low probability of a combination of caching, dropping and dropping in water, the short half-life of DRC-1339 in water, the limited amount of DRC-1339 in a single egg and dilution in water, risks to non-target species from this type of impact are low.

There were also concerns voiced that killing ravens and magpies will result in increased populations of voles which kill sage brush by girdling. WS-Idaho recognizes that ravens and magpies prey on live small rodents, reptiles, eggs and young of birds, insects, and also feed upon carrion. The limited number of ravens and magpies WS-Idaho would remove statewide from implementing PDM activities will probably not directly result in an explosion of the vole population. However, in recent years, areas of southern Idaho have experienced varying fluctuations in vole populations, which have been described as typical vole cyclic population explosions and crashes. It is doubtful that removing ravens and magpies, which are only two of many predator species that feed on voles, would result in such increases of vole populations causing destruction or elimination to the sage-brush ecosystems and damage to agricultural crops.

WS-Idaho would follow all SOPs (Section 3.4) and measures required from ESA consultations to ensure that the program would minimize the potential to harm T/E species and would not jeopardize the continued existence of any T/E species (see Section 4.2.1.2). Non-target take under this alternative is expected to continue to remain low and similar to Alternative 1 due to the high selectivity of the management measures used combined with the expertise and training of WS-Idaho employees.

4.2.5.3 Alternative 5. Impacts on SMAs

WS-Idaho consultation and coordination with land management agencies would occur as described under Alternative 1, only in this case, coordination regarding

PDM for natural resources protection would be conducted by WS-Idaho because WS-Idaho would be conducting the PDM instead of the State or another federal agency. Impacts on SMAs under this alternative would be similar to the current program (Alternative 1) because the additional work proposed is localized and limited in scope and does not represent a significant divergence from Alternative 1. Some activities to enhance wildlife populations may be permitted in SMAs. However, Section in the BLM manual for WSAs stipulates that "If healthy, viable, self-sustaining populations of native species presently exist within the WSA, then a natural distribution, number and interaction has already been achieved and it is generally not appropriate to artificially manipulate natural processes to increase the populations of a native species." Exceptions to this provision are listed and primarily involve actions to restore T/E species populations. There may be a slight increase in work in SMAs; however, the increased program presence would not affect SMAs for the reasons discussed under Section 4.2.1.7. And any raven damage management work in these areas would be closely coordinated with land managers to fully conform with regulations and land use plans.

4.2.5.4 Alternative 5. Humaneness and Ethical Perspectives

Alternative 5 would likely be unacceptable to animal rights advocates and many individuals with strong humanistic and moralistic values would perceive this alternative as similar to or worse than Alternative 1 because of the additional PDM to benefit game and other wildlife species. However, this disapproval would not be universal. In a survey of U.S. public attitudes regarding predators and their management to enhance avian recruitment, Messmer et al. (1999) found that given information suggesting predators are among the threats to a declining bird population, the public generally supported using predator control for the protection of bird populations.

4.2.5.5 Alternative 5. Cultural Impacts including impacts on Native American cultural uses, hunting, non-consumptive uses, and aesthetic impacts

Under this proposed alternative, some predators would be lethally removed. In managing predation damage, WS-Idaho will focus on individual problem predators or localized populations of predators. The proposed action has a low magnitude of impact on target predator populations in Idaho. Dispersal of predators from adjacent areas typically contributes to repopulation of a site, depending upon the level of removal and the predator population levels in the surrounding sites. Problem wildlife which cause the most damage typically have relatively high populations. While the likelihood of seeing a predator in some localized areas could be temporarily reduced as a result of PDM activities, those that are more commonly observed (such as ravens), would continue to be observed while those that are less commonly or rarely, if ever observed (such as mountain lions due to their secretive nature), will continue to be present in the environment, but there would be little visual impact due to the very low likelihood of observing them in the first place. Therefore, the aesthetic and visual impact would probably not be noticeable, and therefore, similar to Alternative 1.

Similar to Alternative 1, WS-Idaho would not notably affect recreational land uses; however, this alternative would be likely to provide benefit to both consumptive and nonconsumptive recreational users of public and private lands (e.g. hunters, photographers, wildlife viewers) as discussed in Section 4.2.5.6.

Where this alternative is successful in assisting IDFG to achieve its management goals of big game and sage-grouse grouse populations in Idaho, the public would benefit by knowing that populations are healthy and there is an increased opportunity to enjoy the resource.

This alternative could result in increases in PDM conducted to enhance prey species populations. During the comment period for the EA, the Nez Perce tribe expressed strong objections to manipulation of predator populations solely to increase hunting opportunities and grave concerns regarding actions to protect rare and sensitive species. In general, the tribe's preference is to exhaust options (i.e., land management and ownership) to address the fundamental problems that led to the risk to the rare or sensitive species (e.g., habitat management) and use nonlethal methods to reduce predator activity in the project area with lethal removal of predators as a last resort because of concerns regarding impacts on complex native ecosystems. No such projects would be conducted on tribal lands without a specific request from the tribe. To address concerns regarding projects that might be proposed in the ceded territories, WS-Idaho has agreed to consult with the Nez Perce tribe prior to initiating new PDM actions in that tribe's ceded territory. WS-Idaho would conduct similar consultations with other federally recognized tribes in the State at that tribe's request. Therefore, we believe the impacts on tribal spiritual, cultural and economic resources from PDM for the protection of livestock, human health and safety, and property would be similar to Alternative 1.

4.2.5.6 Alternative 5. Impacts on Public and Pet Safety and the Environment

Effects from this alternative would be similar to the current program (Alternative 1) because methods would be similar.

The threat of pets or livestock consuming DRC-1339 treated eggs and receiving lethal doses is virtually nonexistent. Clark (1986) reports that the LD_{50} (LD_{50} is a standard notation for pesticides and it stands for lethal dose 50%, which means that in a controlled experiment, 50% of the animals exposed to a toxicant will die) for domestic dogs, sheep and cows are >100 mg/kg, 400 mg/kg and >10 mg/kg, respectively. In order for a 30 pound (14 kg) dog, a 125 pound (68 kg) sheep, and 1,000 pound (454 kg) cow, to receive an LD_{50} dose of DRC-1339, they would have to consume 70, 1,360 and 227 treated egg baits, respectively. It is highly unlikely that these domestic animals can physically consume that many eggs. Besides, when treated egg baits are used for the purpose of raven removal to protect nesting sage-grouse, the number of treated eggs placed per square mile (640 acres) will most likely never exceed 14 at any one time. So in order for a 30 pound dog, 125 pound sheep and 1,000 pound cow to receive an LD_{50} dose of DRC-1339, they would have to locate and eat all treated eggs that were placed in a 5, 97, and 16 square mile area, respectively. The concerns about pets and livestock receiving lethal doses of DRC-1339 after eating treated egg baits is thus discountable and highly unlikely.

4.2.5.7 Alternative 5. Cost Effectiveness

Cost effectiveness would be similar to the current program (Alternative 1) because this alternative is identical in operational structure and strategy (i.e., IWDM is fully integrated into this alternative as it is in Alternative 1). Cost effectiveness would vary if program emphasis were refocused more on natural resource protection and less on livestock protection based on the value of the resources protected, but either way is expected to be positive. Bodenchuk et al. (2002) looked at benefits to protecting sage-grouse, bighorn sheep, mule deer and pronghorn antelope and found that the benefit to cost ratios for predation damage management to protect these and other wildlife species ranged between 2:1 and 22.6:1.

PDM to protect game resources is likely to benefit local and State economies by increasing hunting opportunities for the sportsmen and wildlife viewing in the State. The number of hunters and wildlife viewers in Idaho totaled 804,000 in 2011 (USFWS and USCB 2011), and they spent nearly 7 million days partaking in those activities. Combined, hunters and wildlife viewers expended over $909 million. Expenditures associated with hunting and wildlife viewing include everything from equipment to lodging and travel.

Based on the information provided here, the benefit to cost ratio is expected to be similar to Alternative 1.

4.2.5.8 Alternative 5. Indirect and Cumulative Impacts

This alternative would likely slightly increase target animal take, especially ravens, but would not involve any new methods. Given the ability of the IDFG to use DRC-1339 for raven control under the SLN registration, we anticipate that cumulative take levels of ravens will be similar to what has occurred under Alternative 1, with the primary difference being the entity conducting the PDM.

Some individuals may be concerned that the increased take of ravens could have an adverse indirect impact on ecosystem process (impact trophic cascades). Idaho's raven population is estimated at 50,000 individuals (Partners in Flight Science

Committee 2015) and WS-Idaho's estimated maximum removal of ravens in any one given year under this alternative is 2,291 birds (see Section 4.2.5.1 for more detailed mortality information) or <4.6% of Idaho's estimated population. Combine that take with the four-year average known raven mortality in Idaho (*n*=41) and given the rate of 3.4% increase in the population per year from 1966 to 2012 (Sauer et al. 2014), WS-Idaho take under this alternative would only result in an overall estimated reduction of <600 ravens per year or 1.2% of the estimated population. Assuming that known cumulative human-caused raven mortality (Table 4.16) is additive to all other sources of mortality, WS-Idaho's raven take of 2,291 birds would result in only a little more than the annual population increase from reproduction. However, if raven mortality is in some part compensatory to other forms of mortality (i.e. some of the ravens killed by WS-Idaho would have died anyway from other causes) then the Idaho raven population would continue to increase making trophic cascade inconsequential or discountable because WS-Idaho's influence on the raven population would never result in the total extermination or permanent displacement of ravens in Idaho. Impacts on local areas where raven removals are conducted are also likely to be short-term because of the mobility of ravens and reproduction by individuals remaining in the population. Consequently, indirect ecosystem level impacts of the proposed raven removal are unlikely because of the limited scope and duration of raven population impacts. Additionally, the raven population in Idaho is currently at an artificially high level in the State, supported by human-generated artificial food and habitat. Even short-term local population reductions could help to return raven densities to levels more consistent with available habitat and natural resources. Consequently, a reduction in raven densities is not anticipated to result in adverse indirect impacts on prey populations or trophic cascades.

Under this alternative, WS-Idaho would continue to work collaboratively with State, federal and tribal land and natural resource management agencies and would comply with all applicable State, federal and tribal regulations and policies for the protection of wildlife and their habitats. WS-Idaho assistance with projects to address situations where interactions among species have been perturbed to the extent that short-term localized PDM may be of assistance and is requested by the applicable management agency would increase under this alternative. WS-Idaho monitoring of program activities and new science would occur as described for Alternative 1. This EA will be updated as warranted to address substantive changes. Given WS-Idaho's collaboration with land and natural resource management agencies, internal program monitoring, and the program's commitment to updating the NEPA review as appropriate, risks of adverse indirect or cumulative environmental impacts are low.

4.3 SUMMARY AND CONCLUSION

The current program (Alternative 1) and the proposed program (Alternative 5) provide the lowest overall negative environmental consequences combined with the highest positive effects and benefits (cost effectiveness and reduced livestock losses). Impacts associated with activities under consideration here are not expected to be "significant" or substantial. Based on experience, impacts of the PDM methods and strategies considered in this document are very limited in nature. The addition of those direct and indirect effects and impacts to past, present and reasonably foreseeable future actions would not result in cumulatively significant environmental impacts. Monitoring the impacts of the program on the populations of both target and non-target species will continue. All predator control activities that may take place will comply with relevant laws, regulations, policies, orders and procedures, including the ESA, MBTA and FIFRA. The environmental consequences of each alternative as discussed in this document are summarized and compared in Table 4.26.

For almost all species, declines in use of lethal PDM methods by WS-Idaho under Alternatives 2, 3, and 4 would likely eventually be made up for by non-WS entities. Alternatives 2 and 3 would result in shifts in the use of lethal PDM methods to entities other than WS-Idaho. The primary exception would be the take of ravens with DRC-1339 for livestock protection under Alternatives 2 and 3. Alternative methods for take of ravens for livestock protection may not be as effective in removing ravens or may require substantially more labor to implement than using DRC-1339. Consequently, take of ravens for livestock protection may decrease slightly under this alternative. Take of ravens with DRC-1339 for natural resources protection is not expected to change because the IDFG is anticipated to obtain a Special Local Needs registration to use DRC-1339 for this purpose, as has occurred in the past. Under the current program (Alternative 1), there are already private entities which provide PDM services, including aerial shooting of coyotes for livestock producers. Increased actions by these entities, or new programs by state and county entities, are expected to fill in for the absence of PDM services if they were no longer available from WS-Idaho, although there is likely to be a short-term decline in use of lethal methods until such new programs are established. Efficacy of these programs would vary depending upon the skill and training of the individuals involved. Efficacy of WS-Idaho corrective control actions under Alternative 4 would likely be similar to Alternatives 1 and 5 because most producers who work with WS-Idaho already implement at least one form of nonlethal PDM. However, for the remaining cooperators, there may be some increases in damage to livestock and property where there are delays in implementing nonlethal methods (e.g., time required to acquire livestock guarding dogs) and where nonlethal methods are attempted, but prove ineffective. Potential benefits to livestock owners from WS-Idaho implementation of proactive lethal control of coyotes would initially be reduced under Alternative 4, but increased implementation of corrective damage management efforts may make up the difference (Wagner and Conover 1999). Ultimately, WS-Idaho anticipates that private use of proactive lethal control options to reduce coyote damage would eventually make up for decreases or loss of WS-Idaho program activities.

The EA indicates that WS-Idaho’s use of lethal removal methods would not have significant impacts on target or non-target species populations under any of the alternatives analyzed. WS-Idaho’s lethal take of target species would be highest under Alternative 5, followed by Alternative 1 and Alternative 4. Under Alternative 3 and Alternative 2, there would be no WS-Idaho intentional lethal take of any species although some nominal risk of unintentional take associated with nonlethal methods implemented under Alternative 3 could occur. Alternative 3 may result in higher levels of displacement of target species associated with increased use of nonlethal methods such as frightening devices. The EA indicates that under all alternatives, lethal take (intentional and unintentional) by WS-Idaho would not be of sufficient magnitude, duration or scope to trigger substantial adverse impacts on trophic cascades, biodiversity or ecosystem stability. Impacts by non-WS entities under Alternatives 2, 3, and 4 would likely be the inverse of impacts of the WS-Idaho program, as non-WS entities are anticipated to make up for the loss of lethal PDM assistance by WS-Idaho. Cumulative take by WS-Idaho and non-WS entities would likely decline briefly under Alternatives 2, 3 and 4, until non-WS entities are able to develop and implement their own lethal PDM activities. Under Alternative 4, cumulative impacts are anticipated to eventually reach levels similar to Alternative 1. Take may be reduced under Alternative 3, depending on the resources available to WS-Idaho to implement a nonlethal only program above levels already implemented under Alternative 1. Raven take for livestock protection and protection of property could be slightly lower under Alternatives 2 and 3 because non-WS entities would not have access to DRC-1339 for these types of projects.

The EA indicates that Alternatives 1, 4, and 5 are better suited for ensuring cumulative impacts on wildlife populations do not result in adverse consequences for native wildlife populations. Under those alternatives, WS-Idaho reports take of target and non-target species to the public (e.g., Program Data Reports) and applicable state, federal and tribal agencies. Any unintentional take of target or non-target species associated with WS-Idaho actions under Alternative 3 would also be reported. Agencies with responsibility for maintaining sustainable wildlife populations can use this information to help monitor cumulative impacts on wildlife populations. The state does not require the general public to obtain permits or require their reporting of take for several predator species when animals are taken for damage management. Consequently, under Alternatives 2 and 3, agencies, tribes and the public would have reduced information and input on the number of animals taken, timing of take, non-target species impacts and reasons for take than under Alternatives 1, 4 and 5. This has been demonstrated by the circumstances surrounding the case for the Marin County, California program (Larson 2006). Under Alternative 4, data on proactive removal of coyotes by non-WS entities would not be available.

Risks and potential impacts to non-target species from WS-Idaho's actions are low for all the alternatives. Risks associated with PDM conducted by non-WS entities would vary depending on the skill level and equipment available to individuals conducting the PDM. However, under Alternatives 2, 3 and 4, non-WS entities conducting lethal PDM activities in lieu of WS-Idaho do not have the same obligations in terms of consultation with the USFWS regarding the Endangered Species Act or the Bald and Golden Eagle Protection Act. Non-WS entities also do not have the same system of coordinating with affected public land management agencies. Lack of coordination increases potential risks of adverse impacts on recreation and Special Management Areas. As a result, overall risks to target and non-target species, public resources (e.g., SMAs) and public safety would likely exceed that of Alternatives 1 and 5.

Alternatives 1 and 5 offer the best opportunities for tribal input and consultation regarding impacts of lethal PDM on traditional uses of natural resources, cultural practices and sensitive sites. These opportunities for tribal involvement would be diminished under Alternatives 2, 3 and 4 because non-WS entities do not have the same obligations to federally-recognized tribes as federal agencies.

Ethical perspectives and perceptions of humaneness vary depending upon individual values and experiences. Some individuals oppose use of lethal methods under all circumstances. These individuals are likely to only consider Alternatives 2 and 3 acceptable and may still be distressed because lethal methods are likely to be used by other entities. For others, acceptance of lethal methods may be conditional. For example, individuals primarily concerned about the well-being of individual predators are likely to prefer Alternatives 2, 3 and 4, in part because they perceive the value of the individual animal to be equal to or greater than then resource they may be damaging and that they prefer not to see federal tax moneys used for lethal PDM. These individuals may have greater tolerance of use of lethal methods for the protection of human health and safety and T/E species and strongly disapprove of the use of lethal methods to enhance game species populations, as could be conducted under Alternatives 1 and 5. In contrast, individuals concerned about livestock protection, protection of T/E species and enhancement of game populations may have the opposite perspective. They may share support for use of PDM to protect human health and safety and T/E species, but may be more likely to support PDM for the protection of livestock or enhancement of game species populations. These individuals may particularly prefer Alternative 5, which includes increased WS-Idaho capacity for work to enhance game species populations at the request of IDFG. Nonetheless, even if WS-Idaho use of lethal PDM methods were reduced, lethal PDM using similar strategies would likely be conducted by non-WS entities, so overall perceptions of humaneness may not differ substantially among alternatives, only the knowledge of what lethal actions have been taken may differ among alternatives. As such, alternatives which result in more PDM by non-WS entities and less reporting on PDM actions may be considered less ethical than a federal program with increased reporting and accountability to the public and the tribes.

Risks to human health and safety from WS-Idaho’s actions were determined to be low under all of the alternatives. Risks may be slightly higher for alternatives that have increased PDM by non-WS entities (i.e., Alternatives 2, 3 and 4), depending on the level of training and equipment available to the entities conducting PDM. Non-WS entities would not have access to the WS Aviation Training and Operations Center and are not be held to WS’ standards for aircraft use and maintenance, which exceed the Federal Aviation Administration requirements for safe use of aircraft. Consequently, alternatives that result in increased use of aircraft by non-WS entities are likely to have slightly greater safety risks than the WS-Idaho program.

Implementation of nonlethal and lethal PDM methods has the potential for short-term, localized, seasonal disturbance of non-consumptive recreational and tribal cultural uses of areas where PDM is conducted. Nonlethal methods may sometimes need to be implemented continuously or for longer periods of time than lethal methods (e.g., livestock guarding dogs that may chase wildlife or intimidate recreationists, light/siren frightening devices). Pet owners may have concerns regarding the placement of foothold traps and snares and avoid areas where these devices have been placed. WS-Idaho works with land management agencies and the tribes to identify times and areas where adverse impacts are most likely to occur and WS-Idaho works to select methods and modify procedures to minimize risk of adverse impacts. Alternatives 1 and 5, which include WS-Idaho use of preventive lethal PDM for coyote damage management, may have fewer risks of contact between summer PDM activities and recreational use of public lands because hours of corrective PDM, including use of traps and snares, can be lower in areas where preventive PDM, primarily aerial shooting, has previously been conducted (Wagner and Conover 1999). Potential beneficial impacts on opportunities for hunting game species and opportunities to enjoy T/E species that may benefit from WS-Idaho PDM would be greatest under Alternative 5, with some benefits also occurring under Alternative 1, because these alternatives support greater protection for these species than Alternatives 2, 3 or 4. As discussed above, reductions in WS-Idaho use of lethal methods may result in increases in uses of the same or similar methods by non-WS entities. These entities are not under the same obligations to consult with land managers and the tribes as WS-Idaho and their actions may increase the risks to recreational and cultural uses of sites relative to similar actions by WS-Idaho because without such consultations, the general public, land managers or the tribes will have limited or no ability to influence PDM activities conducted by non-WS entities.

Analysis in the EA indicates that the current program (Alternative 1) can be a cost effective means of resolving conflicts with predators. Relative cost-effectiveness of the alternatives would be directly related to the efficacy of the alternatives. Some costs of implementing PDM would be lower for non-WS entities than for WS-Idaho (e.g., lower payroll costs, reduced costs of implementing APHIS-WS aircraft safety requirements or other standard operating procedures). However, efficacy of non-WS sources of PDM may be more variable or lower than WS-Idaho, depending on the training and experience of the individuals conducting the program. As discussed above, some of the reduced costs associated with use of non-WS entities are because these entities would not provide the same services as WS-Idaho in terms of reporting, consultation and coordination with other agencies, the public and the tribes. Further, non-WS entities do not utilize the WS aircraft operations safety program as discussed above.

Table 4.26. Summary of the environmental consequences of each program alternative relative to each issue.

Issues	Alternative 1 Current Program	Alternative 2 No Federal Program	Alternative 3 Nonlethal Only	Alternative 4 Nonlethal before Lethal	Alternative 5 Modified Current Program (Proposed Alternative)
Effects on Target Predator Species Populations	Well below sustainable harvest levels, including cumulative effects.	WS-Idaho would have no effect on target species. Impact of private actions to resolve damage is likely to have increased negative environmental consequences. Additionally, if WS-Idaho was not conducting the work, the ISADCB, by Idaho State Statue, would still be required to perform PDM.	Effects likely to be similar to Alternative 2 since nonlethal methods that are not effective would likely result in lethal controls implemented by others. Additionally, if WS-Idaho was not conducting the work, the ISADCB, by Idaho Statue, would still be required to perform PDM.	Similar to the current program alternative (Alternative 1) because nonlethal approaches are already used by producers.	Similar to Alternative 1 since PDM activities to protect wildlife would increase slightly. Overall program effort and effects on target species would be similar.

Issues	Alternative 1 Current Program	Alternative 2 No Federal Program	Alternative 3 Nonlethal Only	Alternative 4 Nonlethal before Lethal	Alternative 5 Modified Current Program (Proposed Alternative)
Effects on Non-target Species Populations, Including T/E Species	Low negative impact on other non-target species. Not likely to adversely affect T/E species. Ongoing coordination with USFWS and IDFG will ensure the program would not jeopardize the continued existence of any T/E species.	WS-Idaho would have no negative effects on non-target species populations, including T/E species. Depending upon who implements predation damage controls, the actions of others in the absence of a federal program is likely to have a higher negative effect on non-target species. The uncoordinated and unprofessional actions of others in the absence of a government assistance program are likely to have a higher negative effect on T/E species.	Similar to Alternative 2.	Likely to be similar to Alternative 1.	Similar to Alternative 1 with indirect benefits to wildlife from predation control.
Impacts on SMAs	Coordination with land management agencies, minimal disturbance.	No effect. Potential for negative effects where individuals implement actions to protect livestock grazing on SMAs.	No notable effects, similar to Alternative 1.	No notable effects, similar to Alternative 1.	No notable effects, similar to Alternative 1.
Humaneness and Ethical Perspectives	Public perceptions vary by method, familiarity with the tools and by their relationship to the natural world and to resources protected. WS-Idaho uses selective control techniques that reduce unnecessary pain and death.	WS-Idaho would have no effect. ISADCB may increase efforts, but would not replace all functions of the WS-Idaho. This is the least humane of the alternatives due to actions of untrained private individuals that would likely implement damage control measures in absence of professional assistance. Domestic animals (livestock and pets) would be likely to experience increased predation effects.	Similar to Alternative 2. Preferred by some groups and individuals opposed to lethal control.	Similar to Alternative 1. Some individuals prefer that nonlethal methods always be used first, and that lethal methods only be used as a last resort.	Similar to Alternative 1. Some individuals may oppose PDM to protect sage-grouse and other wildlife.

Issues	Alternative 1 Current Program	Alternative 2 No Federal Program	Alternative 3 Nonlethal Only	Alternative 4 Nonlethal before Lethal	Alternative 5 Modified Current Program (Proposed Alternative)
Effects on Recreation and Aesthetics (hunting and non-consumptive uses)	No notable effects. Coordination with land management agencies ensures minimum effects on recreational users.	WS-Idaho would have no effect. Individuals resolving damages in the absence of WS-Idaho may have negative effects to recreationists.	Similar to Alt. 2 since resource owners may implement their own PDM in the absence of professional assistance.	Similar to Alternative 1.	Similar to Alternative 1.
Impacts on Public and Pet Safety and the Environment	Low risk to public and pet safety due to procedures built into WS-Idaho that minimize the potential for public exposure to dangerous tools.	WS-Idaho would have no effect. ISADCB, IDFG and private individuals may increase efforts but would not replace all functions of the WS-Idaho. Potential for higher negative impact from individuals that may improperly use toxicants or other tools to resolve wildlife damage.	Similar to Alternative 2.	Similar to Alternative 2.	Similar to Alternative 1.
Cost Effectiveness	Positive benefit to cost ratios repeatedly demonstrated.	Not applicable. Resource losses likely to be higher.	Low where nonlethal methods are ineffective.	Moderate due to losses incurred while ineffective or inadequate nonlethal controls are being implemented, thus delaying the effective use of lethal measures.	Positive benefits expected, similar to Alternative 1.
Indirect and Cumulative Impacts	Species populations would not be negatively affected.	No effect by WS-Idaho. ISADCB, IDFG and private individuals may increase efforts but would not replace all functions of the WS-Idaho. The uncoordinated and unprofessional actions of individual resource owners/managers has the highest potential for negative environmental consequences.	Increased potential for negative effects over that of the current program due to the actions of others in the absence of effective professional assistance (where nonlethal methods are not effective).	Similar to Alternative 1.	No notable effects, similar to Alternative 1.

CHAPTER 5: RESPONSES TO COMMENTS

This chapter contains issues raised by the public during the 2015 comment period for the WS-Idaho PDM EA and the WS response to each of the issues. WS-Idaho received 148 comment letters and additional supplemental material regarding the EA. Based on our review of all of the public comments, we have either clarified or enhanced the analysis in the final EA, or responded to the comments below. The comments are organized according to the content of the EA. Issues raised in the comment letters are numbered and are written in bold text. The WS-Idaho response follows each comment and is written in standard text.

5.1 ISSUES AND RESPONSES

ISSUES REGARDING NEED FOR ACTION AND WS AUTHORITIES

1. Is killing wildlife contrary to the mission and purpose of WS? How could an action which includes lethal methods be conducted to benefit wildlife or the public in general?

The mission of WS is to provide federal leadership and expertise to resolve wildlife conflicts to allow people and wildlife to coexist (WS Directive 1.201), when requested by local, state and federal agencies, private entities and tribes. The prevention or control of wildlife damage, which may, but does not always, include removal of the animals responsible for the damage, is an essential and responsible part of wildlife management (The Wildlife Society Standing Position Statement 2015). Congress, through acts authorizing WS (the Act of March 2, 1931 (46 Stat. 1468; 7 U.S.C. 426-426b) as amended, and the Act of December 22, 1987 (101 Stat. 1329-331, 7 U.S.C. 426c)), has established that wildlife damage management for the protection of agricultural resources, including livestock, is an appropriate sphere for federal action. WS' enabling legislation states that, "The Act . . . authorizes . . . the Secretary of Agriculture to conduct activities . . . for the control of nuisance mammals and birds" and "take any action the Secretary considers necessary in conducting the program." (EA Section 1.7.1). Neither the enabling legislation, nor the professional standards for modern wildlife damage management, preclude the use of lethal methods if conducted in a safe, effective, environmentally responsible manner, recognizing the diverse social values pertaining to wildlife and wildlife damage management.

In the United States, wildlife is a publicly-owned resource held in trust and managed by state, local and federal agencies, and tribal governments. Government agencies, including WS, are required by law and regulation to conserve and manage wildlife resources while being responsive to public desires, views and attitudes. In so doing, agencies must respond to requests for resolution of damage and other problems caused by wildlife. WS-Idaho seeks to balance the desire of some commenters for no PDM or no lethal PDM with livestock producer desires to protect their livestock. WS seeks a balance between these extremes to maximize the benefits for the whole public. Ultimately, however, IDFG and the State of Idaho decide this balance, and WS acts consistently with IDFG's policy. The State of Idaho, through its own regulatory and rulemaking processes, has also determined that PDM for livestock protection under specified circumstances is an appropriate action (EA Section 1.3.2).

Before PDM actions are taken in the field, WS-Idaho field staff make careful assessments of the problem and all options for resolving or mitigating the problem. Actions considered and employed should be biologically sound, environmentally safe, scientifically valid, and socially acceptable (EA Section 3.2.1). WS also strives to reduce damage caused by wildlife by emphasizing control methodologies designed to minimize risks to humans, the potentially affected wildlife species, non-target species, and the environment. WS' vision is to improve the coexistence of people and wildlife, while considering a wide range of public interests that can conflict with one another (WS Directive 1.201). Providing the public with access to readily available training and assistance in safe, legal, and effective resolution of conflicts with wildlife helps to reduce the risk that individuals without training or experience may unintentionally cause environmental harm through improper use of PDM methods or intentionally use illegal methods for PDM (e.g., poaching, pesticide-laced meat baits).

2. Who regulates WS? What authority does WS have to kill wildlife including endangered species? WS needs to be transparent and accountable to agencies and the public.

WS is regulated by the agencies with authority for implementation of the various state, federal, and/or tribal laws applicable to wildlife damage management. In Idaho, IDFG is the primary agency with responsibility for management of resident wild birds and mammals. WS-Idaho conducts wildlife damage management activities in Idaho with the authorization of IDFG and pursuant to the MOUs between WS-Idaho and IDFG through the Idaho State Animal Damage Control Board. USFWS has regulatory authority for enforcing the Endangered Species Act (ESA), Migratory Bird Treaty Act, and Eagle Act. WS-Idaho coordinates their actions with land and resource management agencies through work plans applicable to the areas where WS-Idaho works and the species impacted by PDM (See also Section 1.4). All WS-Idaho activities are conducted in accordance with applicable state and federal wildlife laws and regulations

WS' authority under its implementing legislation includes authority to lethally remove animals (See EA Section 1.7.1 and response to Comment 1). Any WS actions impacting species federally protected under the ESA are regulated by USFWS. The ESA defines a narrow set of circumstances under which species listed under the act may be intentionally taken to resolve conflicts (e.g., demonstrable threat to human health and safety). The USFWS has established special rules for some species that establish procedures for addressing conflicts which may include lethal removal of animals under very limited circumstances. The ESA also provides for consultation with USFWS regarding unintentional impacts on ESA-listed species that may result from otherwise legal actions. Provided the action agency consults with the USFWS, complies with all established Reasonable and Prudent Measures, Terms and Conditions and other agreed-upon provisions for reducing risk to listed species, some limited lethal or nonlethal take may be permitted by the USFWS if cumulative impacts of the take will not result in jeopardy to the species.

WS is accountable to the APHIS Administrator, the Secretary of Agriculture and through them, the President, Congress, and the American people whom they represent. WS provides information on program activities through publication of annual program data reports,

3. Wildlife that belongs to and benefits everyone should have priority over livestock on public lands. There should be no lethal PDM for livestock protection on public land.

The Federal Land Policy and Management Act of 1976 (Public Law 94-579; 94th Congress), which provides the federal policy for the management of federal lands, including the BLM and USFS lands, allows livestock grazing. Applicable state and federal laws and regulations (EA Sections 1.3.2 and 1.7.2) permit livestock producers, their employees, and private contractors to implement lethal PDM methods without involvement by WS on BLM and USFS lands. WS-Idaho considered an alternative with no lethal PDM for livestock protection on public lands, but the alternative was not selected for detailed analysis for the reasons stated in Section 3.3.16 of the EA.

4. Is it appropriate to conduct PDM to enhance game species populations just to enhance prey populations for hunters? Is there any science to support PDM for game species enhancement? Should WS conduct PDM for the protection of non-native species (ring-necked pheasants)?

Manipulating wildlife populations to meet human objectives is a standard practice in wildlife management with management agencies routinely managing habitat, harvest, and other factors to meet consumptive and non-consumptive stakeholder interests and reduce wildlife conflicts. Management objectives are identified through the federal, state, local or tribal management agency's stakeholder involvement process, legislative direction, and/or the guidance of advisory boards and committees as appropriate and may be codified in wildlife and resource management plans. As noted in EA section 1.2.3, PDM for game species enhancement is strongly opposed by some members of the general public, animal rights organizations, tribes and conservation groups. Individual perceptions of the appropriateness of this type of PDM are highly variable and depend on personal philosophies and values relative to the relationship between people and animals, licensed harvest of game animals, and the appropriateness of manipulating wildlife populations to meet human objectives. The enhancement of game species also provides aesthetical values to those that wish to view and photograph these animals rather than hunt them. Issues of humaneness and ethics and cultural concerns are addressed in detail for each alternative analyzed in detail in Chapter 4. See also Section 2.3.12. A review of available science on the efficacy of PDM for the enhancement of game populations including applicable materials provided by commenters is provided in EA Section 1.2.3.

Decisions on whether PDM is warranted to enhance game species populations are not under the authority or jurisdiction of WS-Idaho. IDFG makes decisions whether to conduct PDM in Idaho for the enhancement of game species populations on a case by case basis based on information available to the agency. WS-Idaho's role in these projects is limited to determining whether and to what extent to work with the agency on the project, and the potential cumulative environmental impacts of WS' actions.

Based on review of public comments regarding PDM to enhance populations of a non-native species, WS-Idaho consulted with IDFG regarding the anticipated need for PDM to pheasant populations and the likelihood that IDFG would seek to work with WS-Idaho if PDM was needed. Although PDM for enhancement of pheasant populations has been discussed in the past, subsequent review by IDFG indicates no anticipated need for WS-Idaho involvement in PDM to enhance pheasant populations. Applicable portions of Section 1.2.3 have been removed from the final EA as a result of this decision.

5. The EA needs to provide information on livestock losses due to predation in the context of total livestock losses. Livestock losses are low relative to losses from other sources, the cost of the PDM program and total livestock industry sales. Is WS-Idaho involvement in PDM really warranted given these statistics?

Tables 1.2 and 1.3 have been added to put losses from predators in context of other losses. WS-Idaho has had an effective PDM program in place for decades. Therefore, livestock losses in Idaho are the losses that occur with this PDM program in place and are expected to be low. Furthermore, livestock producers generally do not wait for losses to accumulate to a high level before taking PDM action before requesting assistance from WS-Idaho or other entities, but often, for the protection of the livestock under their care, attempt to act before such losses become unacceptable. The reports of livestock losses in the EA do not reflect the losses that might have occurred had actions not been taken to limit losses (EA Section 1.2.1). The important question here is how many livestock are saved from predation by PDM activities? We present data available from studies on the amount of losses that are prevented by PDM in Sections 1.2.1. Available reports indicate that, in the absence of PDM, losses for some producers can be much higher (O'Gara et al. 1983, Nass, 1977, Baker 2008). See also analysis of cost effectiveness for each alternative in Chapter 4. Moreover, as noted in the EA Section 1.2.1, although statewide, regional, or national losses may be low, losses are not evenly distributed throughout the industry. Impacts on individual producers may be substantial.

The decision-maker will weigh the costs and benefits when (s)he analyzes the alternatives identified in this EA, and will make a policy determination based, in part, on that cost/benefit analysis.

6. IDFG statistics on elk populations do not support the idea that predators are limiting elk populations. IDFG data indicate 80% of elk units are at or above management objectives. Lethal removal of predators for elk population enhancement is just being proposed as a method of making it easier for more hunters to be successful at harvesting elk.

The EA does not make any claims that elk populations are currently being adversely impacted by the predators listed in this EA. PDM for the enhancement and protection of wildlife populations, such as elk, is conducted as a short-term localized effort in areas where a problem has been identified by the management agency (here the IDFG) in a manner consistent with management objectives for the species, which may include maintaining sustainable hunting opportunities for the public, and is not conducted as a range-wide application independent of need.

The types of PDM for wildlife population enhancement listed in EA Section 1.2.3 are examples based on past requests for assistance in Idaho, requests for WS-Idaho assistance in similar programs in other states, and a limited number of current requests. They are provided as an indication of the type of requests WS-Idaho could receive and respond to so long as the action is allowed under the alternative selected and impacts from the action would not exceed those analyzed in this EA for the selected alternative. The only PDM action currently conducted by WS-Idaho for the protection of wildlife involving the predator species listed in this EA, is a limited project to remove coyotes, badger and fox preying on federally-listed threatened northern Idaho ground squirrels conducted at the request of the USFWS (In 2015, 4 badgers and 3 coyotes were removed for the protection of Northern Idaho ground squirrels). WS-Idaho has received a request from IDFG to assist with a study assessing the impact of localized raven population reduction on sage-grouse populations (IDFG 2013a) under a USFWS scientific collecting permit issued to IDFG. WS-Idaho participation in this project would result in raven take greater than that allowed under the current program and will not be conducted by WS-Idaho unless Alternative 5 is selected.

7. **Available science indicates ecosystems work better without intervention. Nature should be left alone to take care of balance of predator and prey populations. There is no need to conduct PDM to enhance prey populations.**

We acknowledge that natural systems are complex, and that sustainable natural systems usually do not require human intervention. However, extensive land development and resource use to meet human needs has altered natural systems, and, in select cases, human intervention may be necessary to maintain or restore prey populations, and meet state wildlife management objectives (Diamond 1992). For example, habitat fragmentation and development can cause changes in predator dynamics, density, and diversity of predators (Fichter and Williams 1967, Baxter et al. 2007, Coates and Delehanty 2010), including driving predators to live closer to human habitation. Decreased habitat quality and quantity can make prey species more vulnerable to predation and increase the kill efficiency of predators (Connelly et al. 1991, Coates 2007, Hagen 2011). The ability of some predators to utilize human structures and take advantage of food sources resulting from human activity (e.g., agriculture, trash, roadkill) may enable higher densities of predators to exist in areas than would otherwise be supported. In other cases, otherwise “normal” levels of predation may be more than can be sustained by a prey species that is already at extremely low levels as a result of human activity (e.g., habitat loss, adverse impacts of introduced species, introduction of diseases). In these instances, short-term limited predation management may be beneficial as part of an integrated effort to achieve management objectives for prey species.

8. There would be no conflict if livestock were not on public lands. We put livestock in predators' habitat, and this is the logical result.

This statement incorrectly assumes that predation of livestock only occurs on public lands and that the wildlife that causes the conflicts addressed in this EA are limited to public lands. Much of the livestock losses documented by WS-Idaho and subsequent PDM actions occur on private property. WS-Idaho MIS data indicate that during FY15, 65% of the livestock depredation management work tasks reported in the MIS system were on private lands and only 35% were on public lands. Congress has directed that public lands be utilized following the multiple-use philosophy (see Response 3 above), which includes grazing by livestock. The potential for conflicts between wildlife and grazing livestock was a key factor considered by Congress in establishing the WS' predecessor agency to help resolve those conflicts (Hawthorne 2004).

9. Are loss estimates in the EA exaggerated? Losses should be confirmed by an independent authority. Aren't there compensation programs in place to cover most costs of livestock losses? Shouldn't WS consider a "compensation only" alternative even if funds are not currently available?

Loss estimates in the EA are not exaggerated. WS-Idaho used the best available information on livestock losses due to predation, including WS-Idaho data on verified and reported losses and NASS livestock loss reports. EA Section 1.2.1 discusses the relationship between losses confirmed and reported to WS-Idaho and total livestock losses in the State. Establishment of an independent authority to confirm all losses is unrealistic. That independent authority would have to identify and confirm losses soon after they occur or decay and scavenging will destroy evidence indicating the species which caused the damage. It would not likely be able to do that. Searching for lost animals, especially in large grazing allotments or pastures, in areas with rough terrain, and areas with extensive shrubs or trees, can be extremely labor intensive. Therefore, staffing for this type of effort would cost too much. In general, this level of intensive monitoring has only been feasible for limited-scale research projects. Similarly, costs associated with locating and confirming all, or at least a significant majority of, predator losses statewide in a compensation only alternative are also likely to meet or exceed WS-Idaho PDM program costs, even if resources are reallocated from current operational and technical assistance projects to confirming losses.

Compensation for wildlife damage is only available for damages caused by a few of the species addressed in the EA. The Idaho Big Game Depredation Prevention and Compensation program provides advice, assistance, supplies, compensation, and other services to private landowners experiencing damage caused by deer, elk, pronghorn, moose, black bear, mountain lion, and grizzly bears (when not protected by the ESA). To be eligible for compensation, claims must exceed $1,000 in value (considered the owner's deductible) and the landowner must have provided reasonable access for hunting. A $1,000 deductible is applied to all claims, except for crop losses that occur in subsequent years in the same location where the Department was unable to prevent damage following the first occurrence. The Department pays an average of $245,000 for 30 claims annually. Crop losses account for 91% of these payments, while livestock and rangeland forage payments account for 6% and 3%, respectively. Accordingly, annual payments for livestock losses average approximately $14,700 - far less than the actual predation losses experienced annually by livestock producers in Idaho.

The Agricultural Act of 2014 (aka Farm Bill) has provisions for the federal government to provide indemnity payments to eligible producers on farms that have incurred livestock death losses in excess of the normal mortality, as determined by the Secretary of Agriculture, due to attacks by animals reintroduced into the wild by the federal government or protected by federal law, including wolves and avian predators. Payments are equal to 75% of the market value of the applicable livestock on the day before the date of death. For purposes of this EA, the Act could only provide indemnity payments for livestock losses to grizzly bears (while federally protected under the ESA), eagles, ravens, magpies and crows.

Although the compensation programs listed above are helpful, data from NASS livestock loss reports indicate that known losses to grizzly bears, eagles, ravens, magpies and crows comprised only a small portion of total livestock losses to predators (less than 12% of sheep, 6% of lambs, 5% of cattle and 8.3% of lamb losses[24] (Tables 1.2 and 1.3)). In contrast, there is no compensation program for losses to coyote predation, which accounted for 63% of sheep losses, 86% of lamb losses, 4% of cattle losses and 27% of calf losses.

WS-Idaho's reasons for rejecting a compensation-only alternative are not limited to the availability of funds for compensation. In addition to the reasons originally stated in Section 3.3.1 of the EA for not selecting this alternative, reviews of compensation programs indicate that these programs do not generally improve tolerance of the species causing damage (Naughton-Treves et al. 2003) and do not address indirect costs of wildlife damage (Steele et al. 2013). Compensation programs for recovering wildlife species can, in some cases, increase to the point where funds needed for compensation undermine budgets for conserving other species (Treves et al. 2009). Some authors have raised concerns that compensation programs may make producers less risk-averse and less likely to adopt new or improve existing management practices (Nyhus et al. 2003). For these additional pragmatic reasons, a compensation-only alternative is infeasible.

We continue to assert that strictly from an economic perspective, federal, state and local government entities are highly unlikely to allocate sufficient funds to compensate for all livestock losses to predators even if WS requested those funds. A basic estimate of the funding available that might currently be available to subsidize implementation of nonlethal methods can be made using the FY 2015 WS-Idaho PDM budget. In FY 2015, WS-Idaho spent approximately $1,194,500 on PDM (excludes wolf damage management). If a compensation only alternative is selected, federal funding currently used for aircraft and pilots ($467,400) would be reallocated by the WS Regional Office to other states that still implement aerial programs. Assuming that other staffing costs ($555,600), and vehicle costs ($103,500) remain the same, approximately $171,500 would be available to compensate for livestock losses. This is substantially less than the amount of losses currently verified by and reported to WS-Idaho (FY 2012-2014 annual average

[24] Assumes all losses to "other predators" involved species for which compensation is available.

$262,139; Table 1.6). As noted in Section 1.2.1, WS-Idaho does not verify all losses to predators. NASS data indicates that producer reports of cattle and sheep livestock losses, even with a PDM program in place, and exclusive of other types of damage caused by the predators addressed in this EA, amount to over $4.2 million per year in Idaho alone – well in excess of current WS-Idaho expenditures for PDM (Tables 1.2 and 1.3). And we anticipate that in the absence of PDM actions within the State, these losses would increase.

10. The EA exaggerates the importance of public lands ranching and agriculture as a whole by reporting total livestock for the State. Most cattle are on feedlots and dairies. Specifically, WS actions only benefit a handful of private interests on public lands.

WS-Idaho disagrees that the majority of WS-Idaho PDM actions involve livestock grazing on public land and it disagrees that most cattle are on feedlots and dairies. WS-Idaho MIS data indicate that during FY15 (October 1, 2014, to September 30, 2015), 65% of the livestock depredation management work tasks reported in the MIS system were on private lands and 35% were on public lands. WS provides services to all livestock producers that request assistance including small, minority-owned, and disadvantaged producers. The NASS reported in their 2014 State Agriculture Overview for Idaho that 36.1% of the cattle within the State were dairy or on feed (i.e., feedlot) while the remaining 63.9% were not feedlot or dairy cattle (NASS 2016*a*). The majority of cattle grazed on public lands are ultimately shipped to feedlots for "finishing", so the data may underestimate the proportion of cattle that have spent at least some time grazing on public lands.

11. Is predation only a problem because producers are not taking adequate care of their livestock? Does the livestock industry turn herds loose with no supervision?

No, predators do not attack livestock only because producers are, as the commenters are alleging, not taking adequate care of their livestock. We agree that turning livestock loose with no supervision for long periods would be a problem. However, based on years of experience working with the livestock industry, WS-Idaho does not believe that this is standard practice. There is regular oversight by ranchers, or their employees, of their herds. See Section 2.3.18 regarding producer responsibility to take care of their livestock. Although there is no law or policy requiring livestock producers to employ good husbandry practices to protect their livestock, most Idaho livestock producers do employ a variety of husbandry practices to protect their animals as a matter of good business—they would preserve their investments in their livestock by protecting their livestock. A recent NASS report indicates that, nationwide, use of nonlethal PDM methods by sheep producers has increased from 31.9% of producers in 2004 to 58% in 2014 (NASS 2015). In Idaho, 66% of sheep producers used nonlethal PDM methods, which was higher than the national average.

12. WS should not participate in IDFG sage-grouse study or other predator removal projects for natural resources protection because it is a distraction from real problems that should be addressed. Resources should be used for habitat management.

We disagree that WS-Idaho's participation in the proposed IDFG sage-grouse study is a distraction from the primary problems impacting sage-grouse. Instead, projects like the IDFG sage-grouse study are intended to determine if PDM has utility as a short-term localized supplement to existing efforts to address primary threats affecting sage-grouse populations. Section 1.2.3 discusses the potential role of PDM in sage-grouse restoration and its relationship to other ongoing sage-grouse recovery efforts.

WS supports the suggestion that habitat restoration projects benefit Idaho wildlife and should be implemented by the agency with jurisdiction whenever possible and practicable. These type of projects, though, are not the type of actions which fall within the scope of WS' decision-making authority. Ultimately, the determination that PDM is warranted for wildlife population protection or enhancement is made by the agency(ies) with management authority for the particular species needing protection, and the agencies with regulatory authority for the predator species to be managed (e.g., a USFWS permit for raven removals in the IDFG sage-grouse protection study).

13. Instead of PDM, WS should focus on reduction or elimination of non-native species, especially species that are competing with native wildlife or are having unacceptable impact on native species.

Most predator species involved in conflicts in Idaho are native species. However, the EA does include management of damage and conflicts associated with feral and free-ranging dogs and cats. The commenter is proposing an alternative purpose and need for agency action. The role of WS-Idaho in other types of wildlife damage management is outside the purpose and need for this EA.

14. Are perceived threats of loss sufficient to trigger PDM, especially on public land?

The primary concerns expressed on this topic were that PDM actions may be initiated in response to perceived but unsubstantiated threats from the public, and that PDM may be used proactively. The concern was expressed that individual perceptions of risk from predators could be disproportionately high to actual risk and could potentially result in a request to have a predator lethally removed just because someone saw the animal near their neighborhood/business/animals. Individuals who felt wildlife should not be killed to protect livestock on public lands were particularly concerned about this issue in context of PDM actions on public lands. WS-Idaho does not initiate lethal PDM actions without conducting an investigation of the situation and verifying that there is a need for some kind of action to either directly address the depredation or provide technical assistance to advice on how to minimize the risk in the future (see WS Decision Model, step 2-"assess problem" (WS Directive 2.201)). WS-Idaho recognizes that increasing numbers of people are unfamiliar with wildlife and may experience anxiety when they encounter wildlife, especially predators, in their proximity. WS-Idaho personnel commonly provide technical assistance (advice, training, educational materials) to individuals and communities so they have the information needed to better understand the role and potential impacts of wildlife in their area. These consultations include advice on nonlethal strategies to prevent or reduce the likelihood of any potential future conflicts.

WS-Idaho only provides PDM assistance in response to requests for assistance. In most cases where lethal PDM is implemented, the requestor has already experienced losses. This may include historical damage from years where it is reasonable to assume damage will reoccur. It may also include risks to human health and safety, where a risk has been determined regardless of actual damage occurring (e.g., bear or lion activity around urban areas and schools that may threaten the safety of children; the risk is real but no attack has occurred). Proactive lethal PDM for livestock protection (i.e., preventive measures taken in anticipation of damage that is likely to occur in the near future to prevent those losses) is only conducted to address coyote predation and is only a small portion of total WS PDM activities. Proactive control is generally only conducted in areas with a history of chronic predation problems and areas where coyote problems were ongoing prior to moving sheep out at the end of the previous year's grazing season.

ISSUES REGARDING ALTERNATIVES AND METHODS

15. Lethal PDM methods should only be considered acceptable when addressing risks to human health and safety.

As noted in the descriptions of the current program, WS-Idaho implements nonlethal methods where practical and effective, but nonlethal methods may not be the first response to a damage problem. Risks to human health and safety can be the type of need for action which may warrant use of lethal methods immediately without implementing nonlethal methods. Requests for assistance with threats to human health and safety that would warrant use of lethal methods under the current program are uncommon. In the case of a threat to human safety that would warrant use of lethal methods, the risk is usually such that another entity would take the action if WS-Idaho did not provide lethal management assistance (e.g., Alternatives 2 and 3). Consequently, impacts of a "WS Only Uses Lethal Methods for Risks to Human Health and Safety" alternative would be virtually identical to Alternative 3 – Nonlethal Management Only. Therefore, this alternative is substantially similar to an alternative WS is already analyzing, and it is already, therefore, within the spectrum of alternatives the decision-maker will consider when making his policy decision.

16. WS should not use tax dollars for lethal PDM to benefit livestock producers just so businesses can have a profit. Use of taxpayer money for predator control is a subsidy. Taxpayer funded PDM on public lands compounds the problem with subsidies because livestock grazing on public lands is already heavily subsidized.

We understand that there is opposition to the use of federal land for livestock grazing, and that any associated lethal PDM may be more unacceptable. In authorizing WS to assist in resolving conflicts with wildlife and through allocation of funds for PDM, Congress has made the policy decision that PDM, including the actions proposed in this EA, is an appropriate sphere of federal action, and therefore provides appropriated funds to be used in addition to funds received from the cooperator requesting the assistance. Similarly, state and local government entities have also determined that funding the WS-Idaho PDM program was an appropriate allocation of public resources. WS understands that some people oppose Congress's funding priorities and decisions. WS also understands that some people oppose lethal PDM and that use of public funds for an activity they find unnecessary and morally reprehensible. As with many other issues relative to PDM, perspectives on this issue differ depending on the values and experiences of the individual. In contrast to some people's opposition to the PDM activities, other individuals contend that the United States is responsible for assisting when damage by the public's wildlife adversely affects private property.

As noted above, The Federal Land Policy and Management Act of 1976 (Public Law 94-579; 94th Congress) provides federal policy on federal lands, including the BLM and DOI (FS), to include livestock grazing. 16 USC § 528 states, "It is the policy of the Congress that the national forests are established and shall be administered for outdoor recreation, *range*, timber, watershed, and wildlife and fish purposes . . . ." (Emphasis added). Congress has already decided that livestock grazing on public lands is one use among many for those lands.

WS does not subsidize livestock production nor does WS pay compensation for livestock losses. The role WS serves is to assist the American public (i.e., not just livestock producers, but the greater agricultural community, state and federal agencies, private and public organizations, educational centers, tribes, and the general public) to resolve conflicts that arise with wildlife, which are a publicly-owned resource. WS serves to provide federal leadership in resolving these conflicts and is publicly accountable for the work that is performed (e.g., all activities are summarized and made available to the public via the WS website, activities are inspected by the Office of Inspector General when they receive allegations of wrongdoing and whose findings are made available to the general public, and WS makes all planning decisions that are founded through the National Environmental Policy Act processes). Issues of whether or not livestock grazing on public lands is or should be subsidized are outside the scope of this EA.

17. WS should consider an alternative that requires livestock producers to avoid grazing livestock in areas near predator dens, rendezvous sites and other high vulnerability areas; remove carcasses and sick and weak animals; abstain from lambing/calving on public land; demonstrate that herders were present around the clock and in sufficient number to deter predators; and participate in training on nonlethal PDM methods.

A nonlethal before lethal alternative was analyzed in detail in the EA. This specific variant on a non-lethal before lethal alternative was not considered in detail because several of the mandated actions are likely to be impractical or inappropriate for all circumstances. For example, herders are not a cost effective solution for small farms and ranches. Producers, to the extent practicable, work to avoid grazing livestock near den and rendezvous sites. However, producers have no control over whether or not predators establish den or rendezvous sites near their livestock, and with some common predators, such as coyotes, it may be virtually impossible to avoid grazing "near" dens, especially for producers grazing on private lands. Producers may not have the option to move their livestock elsewhere either because they have limited access to grazing lands or because the land management agency establishes the timing and routes for sheep bands and, to minimize environmental concerns, cattle are not maintained in tight bands as with sheep. In dry years, in order to minimize risk of adverse effects on range, producers may spend shorter times in any given area but then need to use all or most portions of their allotments instead of avoiding areas with a history of predator conflicts. Instead of mandating a specific set of management alternatives for all producers, the WS-Decision Model and IWDM process that would be used by WS-Idaho under alternatives 1, 3, 4, and 5 allows for identification of practical and effective site-specific recommendations for nonlethal management strategies. See also Responses 27, 28 and EA Section 2.3.18.

18. Lethal methods are not effective because predator populations regenerate after removals.

The commenter misunderstands the metric by which WS-Idaho is measuring the effectiveness of its lethal methods. In this EA, WS-Idaho identified its purpose and need for PDM as resolving the conflict, and not necessarily reducing predator populations. PDM is intended to solve immediate damages caused by predators when livestock or wildlife species are most vulnerable to predation, such as during calving, lambing or nesting seasons. Not all animals of a given species will prey on livestock. Consequently, when lethal removal is conducted, the goal is often to focus on removing the specific animal(s) associated with the problem and not necessarily to reduce population density. In many instances, predation is relieved with short-term control actions.

Nonetheless, at times, WS-Idaho may seek to reduce local populations of particular predators for narrow purposes. WS-Idaho already knows that so long as mortality rates remain within sustainable limits, populations of predators such as coyotes will rebound after removals and the effects of lethal removals on local populations may indeed be short-lived. When predation is chronic, lethal PDM assistance may be required in subsequent years.   In situations where localized population reduction is warranted, the period when the prey species is most vulnerable is usually relatively short (e.g., lambing, nesting), and the impact of removal of individual animals, although short-term, may be of sufficient duration to resolve the specific damage problem. The scientific fact that immigration of non-territorial animals from the surrounding area, reproduction by the remaining individual and compensatory mortality may offset lethal control actions supports WS-Idaho’s conclusions that lethal control actions are not likely to have long-term adverse effects on predator populations, biodiversity, or trophic cascades because reproduction by remaining individuals, compensatory mortality, and immigration help to keep sustainable predator populations relatively stable or retain naturally increasing population trends (see analysis on target and non-target species populations in Chapter 4).

19. WS should support development and implementation of effective nonlethal methods. Traps, poisons and guns are easy solutions but not the right solutions. WS needs to strive towards a goal of using all nonlethal methods. WS should reach out to other entities for assistance in developing better nonlethal methods.

WS fully supports the research and development of effective nonlethal methods and has one of the top research facilities in the country devoted to research and development of such strategies and techniques. WS' NWRC is the only research facility in the world devoted exclusively to wildlife damage management. WS Directive 2.101 gives preference to practical and effective nonlethal methods and an SOP in Section 3.4.2.2 notes that current and newly developed nonlethal methods would be encouraged for use where appropriate. An SOP in Section 3.4.2.4 calls for WS to continue research to improve the selectivity and humaneness of PDM methods. The NWRC works with a wide range of universities, private organizations, and others to develop and improve wildlife damage management methods including nonlethal methods. See also Response to 27, which describes WS's research and prioritization of nonlethal methods.

20. WS should consider an alternative that subsidizes implementation of nonlethal methods.

Under the current program (Alternative 1), WS-Idaho already subsidizes the implementation of some nonlethal PDM methods. For example, propane cannons and pyrotechnics are loaned/distributed by WS-Idaho to livestock producers to prevent predation, and radio-activated guards (RAG) are used by WS-Idaho and loaned to livestock producers where predators with radio collars (e.g., grizzly bears) may be present. WS-Idaho could also include subsidizing use of some nonlethal methods as a component of Alternatives 3, 4 and 5. Depending on available funding, a subsidy for nonlethal methods could include covering the cost of livestock guarding animals, assistance in paying for nonlethal methods such as fencing (where applicable), and loan or permanent provision of frightening devices, such as pyrotechnics and electronic guards. At present, WS-Idaho cooperators that partially fund PDM in Idaho have not expressed interest in providing funding to subsidize implementation of nonlethal PDM methods. Consequently, all funding for implementation of this type of strategy would have to be from WS-Idaho federal appropriations.

Instead of including subsidization of the implementation of nonlethal PDM as a component of Alternatives 1, 3, 4, or 5, it could serve as a standalone alternative. In this case, WS-Idaho staff would be available to provide technical assistance with PDM and would assist cooperators with costs of nonlethal PDM methods. A basic estimate of the funding available to subsidize implementation of nonlethal methods can be made using the FY 2015 WS-Idaho PDM budget. In FY 2015, WS-Idaho spent approximately $1,194,500 on PDM (excludes wolf damage management). If a "subsidized nonlethal methods" alternative is selected, federal funding currently used for aircraft and pilots ($467,400) would be reallocated by the WS Regional Office to other states that still implement aerial programs. Assuming that other staffing costs ($555,600), and vehicle costs ($103,500) remain the same, approximately $171,500 would be available to subsidize nonlethal PDM supplies. For context, a program in Marin County, CA that provides subsidies for nonlethal methods (livestock guarding animals and fencing) to address coyote predation cost an average of approximately $20,000 per year for the period of FY 2012-13 and FY 2013-14 (Marin County, CA, 2014, unpub. data). The program caps assistance for producers with 299 sheep and goats or less at ($1,500 per year) and flocks of 300 or more animals at $3,000 per year. After acquisition of a livestock guarding animal, yearly maintenance assistance of up to $350 per dog and $200 per llama is also available. If costs per county in Idaho were similar, the funds currently available to WS-Idaho for operational PDM would cover approximately nine counties and would be insufficient to address statewide needs. Furthermore, approximately 42% of the funding to implement the WS-Idaho PDM program comes from cooperators. In comments on the EA, livestock producers and producer organizations indicated they believe a fully integrated program including use of nonlethal and lethal methods is needed to adequately address conflicts with predators in the state. If WS-Idaho chooses to implement a program in which WS-Idaho employs only technical assistance and subsidies for nonlethal methods, these entities may seek alternative sources of PDM assistance which would reduce the funding available for a WS-Idaho nonlethal PDM subsidy program.

Nonlethal PDM methods are extremely limited for some applications (e.g., predation on range herds of cattle), and, in some cases, predation persists despite implementation of practical and effective nonlethal methods. If this alternative were implemented, WS-Idaho would be unable to provide operational assistance for producers with conflicts that could not be addressed through the subsidy program. The allocation of resources under this alternative would not leave funding for operational assistance with other types of PDM requests including response to risks to human health and safety. Given that WS-Idaho does not have the anticipated resources needed to fully implement this alternative statewide and that WS-Idaho would not be able to adequately meet the full purpose and need for action, a “technical assistance and subsidy for nonlethal methods” alternative will not be analyzed in detail.

21. No federal money should be used to assist in predator management to protect or enhance wildlife populations.

WS-Idaho does not use federal allocations to WS-Idaho to pay for PDM projects to protect or enhance wildlife populations. These projects are funded entirely by the agency that requests the projects (e.g., IDFG or USFWS). Allocation of USFWS resources for projects to protect T/E species is outside the scope of WS-Idaho decision-making authority.

22. WS should be financially liable for pets killed.

Nothing in this EA or any decision WS reaches may immunize WS from any legal claims that Congress has allowed or will allow. The federal government, including WS, may be held liable for monitary damages resulting from negligence by its employees acting within the scope of their employment, pursuant to a limited waiver of the federal government’s sovereign immunity under the Federal Tort Claims Act of 1946.

23. WS trappers who have violated laws should be prosecuted and punished for their crimes.

Federal employees, including WS employees, who are found guilty of violating laws, are subject to appropriate disciplinary measures, including punishments that may be imposed by courts.

24. It is inappropriate for WS to sell furs and other parts taken during PDM.

WS employees or family members, close relatives or acquaintances may not benefit from any animal(s), whole or in part, taken by WS during the course of their official duties (Directive 2.510). This includes, but is not limited to, fur or valuable animal parts. Furs and other animal parts collected during normal WS control activities may be salvaged, sold, donated, transferred (e.g., for research or educational or cultural purposes to schools, museums or tribes), or otherwise disposed by the state WS office provided that the method of disposal is in compliance with existing cooperative service agreements, MOUs and all applicable federal, state and local laws and regulations. When any furs or parts have been salvaged for sale, they have been transferred to the ISADCB for sale and all proceeds are deposited into the ISADCB accounts. Costs of salvaging furs have exceeded benefits from their sale, so furs have not been salvaged for transfer to the ISADCB in over 10 years.

25. Development of alternatives with only one viable alternative is inappropriate.

The five alternatives addressed in detail are reasonable and viable responses to predator damage in Idaho and were developed to address issues and suggestions provided in public comments. The EA evaluates each alternative for its potential to effectively resolve the conflicts for which action is being proposed. Each alternative will resolve those identified conflicts to varying degrees. The intent of this EA is to identify an alternative that will best address the conflicts and issues that have been identified by the agencies and public as relevant to PDM in Idaho.

26. The EA does not accurately apply Integrated Pest Management (IPM) to the issue. IPM applies the most effective combination of solutions, in their most effective sequence and schedule to optimize the cost/benefit ratios of the management problem.

We do not agree. See EA Sections 3.2.1- Integrated Wildlife Damage Management and Section 3.2.1 – The WS Decision Making Process for a description of how IPM and the WS Decision Model are applied to develop site-specific management strategies that address all of the issues relevant to resolving damage by predators. Through use of the WS Decision Model, WS-Idaho employees identify the appropriate combination of methods, used concurrently or sequentially, as appropriate, to address a specific predation event, considering the complete set of direct and indirect methods that can be applied by WS-Idaho and by the cooperator. Although cost:benefit ratios are an important consideration in IPM process, they are not always the primary factor determining the combination and sequence of PDM method application by WS-Idaho. Cost considerations must be balanced with other factors including, but not limited to, the need to protect T/E species, minimize impacts to recreation, protection of human health and safety, and the ability and willingness of the cooperator to implement risk-reducing actions such fencing. If fencing is determined to be an appropriate action, other methods may need to be applied to address predation on livestock until fencing is completed.

27. Does WS-Idaho implement a policy of using nonlethal methods as part of its IWDM program in good faith? Is the EA biased toward use of lethal methods?

Full consideration is given to all viable alternatives and methods, including nonlethal methods. The EA reviews a full range of nonlethal PDM methods appropriate for the species addressed (See Appendix C). The EA also gives full consideration to an alternative in which WS-Idaho would be restricted to only using and recommending nonlethal PDM methods (Alternative 3) and an alternative that would require use of nonlethal methods before lethal methods (Alternative 4). In alternatives that include use and recommendation of nonlethal and lethal methods (Alternatives 1, 4 and 5) preference is given to nonlethal methods where practical and effective (WS Directives 2.101, 2.105 and 2.201).

Most nonlethal methods must be purchased and implemented by the livestock producer because of the cost and time involved in labor and materials. For example, acquisition and daily care of livestock guarding animals is best implemented by the producer, as is the construction of permanent predator-proof fencing and animal husbandry tasks that are implemented once or more daily (e.g., checking animals, moving animals to night pens) (Appendix C). WS-Idaho may strongly recommend these measures, but their implementation will not show in WS-Idaho records. When conducting initial site investigations, WS-Idaho personnel review producer-implemented nonlethal practices and recommend additional strategies and improvements to existing strategies as appropriate.

WS-Idaho currently employs nonlethal strategies and tools throughout its routine PDM efforts in Idaho. Appendix C and Section 3.2.1 describe the nonlethal methods that are utilized by WS-Idaho and the nonlethal methods that are loaned/distributed and taught to livestock producers by WS-Idaho. For example: propane cannons and pyrotechnics are loaned/distributed to livestock producers to prevent predation; radio activated guards (RAG) are used by WS and loaned to livestock producers where predators with radio collars (e.g., grizzly bears) may be present; nonlethal strategy workshops are hosted by WS to provide information and education to livestock producers on new advances in nonlethal strategies to protect livestock; the routine presence of WS field employees in the pastures provide some degree of deterrence for predator presence within those pastures; and WS employees often deploy non-lethal strategies to resolve conflicts where they are effective (e.g., a black bear was harassing cattle within a pasture and could have attempted to depredate upon them, but had not. Rather than seeking to kill the bear, the WS employee walked through the pasture so that his human scent would blow across the field. When the bear smelled him, it quickly left the pasture, resolving the conflict with a non-lethal strategy.). The WS NWRC also conducts research on the development, testing, and improvement of nonlethal strategies to resolve wildlife conflicts. In addition, WS-Idaho supports educational programs that encourage the expansion of knowledge on wildlife damage management issues (Section 3.3.2.1 The IWDM Strategies Employed by WS-Idaho).

WS was instrumental in the introduction and adoption of livestock guarding dogs in the late 1980's and early 1990's and continues to recommend use of livestock guarding dogs where appropriate (Green and Woodruff 1983, 1988). Current commonly-used livestock guard dog breeds have been less successful in addressing conflicts with increasing populations of larger predators such as mountain lions, bears and wolves. Livestock guard animals such as llamas and donkeys can be preyed upon by these larger predators. In response, the research branch of WS, the NWRC, has initiated research into new breeds of livestock guarding dogs better suited to protecting livestock from larger predators (Marlow 2016). WS has also undertaken efforts to reduce potentially threatening confrontations between livestock guarding dogs and humans that have limited acceptance of livestock guarding dogs in some areas. WS is working collaboratively with livestock producers and land managers on ways to reduce interactions between livestock and recreationists and on the production and dissemination of educational materials and informative signs on livestock protection dogs (Marlow 2016).

28. Ranchers should be required to hire herders for livestock.

WS does not have authority to require ranchers to hire herders for livestock, so this alternative is infeasible as part of this EA. Nonetheless, sheep producers routinely use herders with their animals to keep them together in a band and moving through the allotments. Due to the dispersed nature of cattle grazing, herders are not an effective management strategy, but range riders can help reduce risks of predation by moving cattle away from areas of high predation risk and promptly identifying animal health and predation incidents so they can be addressed to minimize livestock losses. WS-Idaho responds to requests for PDM assistance from producers with large herds/flocks that graze on open range and producers with small herds/flocks in fenced pastures. Use of herders and range riders represents a substantial financial obligation and may not be cost effective for producers with smaller herds/flocks. For producers with small flocks in fenced pastures, it may be better to incur a one-time investment in installing quality fencing that would last for years than the annual expense of a herder.

29. WS-Idaho actions should be funded through a head tax.

Head taxes (e.g., a tax on animals sold) and or taxes on pounds of wool sold have been used by State and county entities in many parts of the country to fund programs to assist the livestock industry including PDM programs by WS-Idaho or other entities. Congress has not given WS legal authority to implement a tax of this type or for this purpose. Head taxes must be established voluntarily and through other authorities. In Idaho, the Idaho State Animal Damage Control Board (ISADCB), which was established by the Idaho Department of Agriculture, has established a head tax. It receives funds via brand inspection fees on the sale of cows and calves. It also receives funding via a sales fee on wool. The five districts within the ISADCB individually decide how those funds will be spent--whether to use the funds for nonlethal programs, contracting with private entities to conduct PDM activities, or to enter into cooperative service agreements with WS-Idaho. When the State enters into such agreements with WS-Idaho, the agreements establish how and for what purpose WS-Idaho is receiving the funds and how the funds may be spent (as is standard procedure for all federal programs).

30. Livestock producers should pay all costs of PDM.

WS' enabling legislation provides authority for the Secretary of Agriculture to make expenditure of funds for the protection of agricultural resources. Congress, through annual allocations for the WS, has determined that PDM is an appropriate sphere of federal action. Pursuant to 7 U.S.C. 426c, WS may enter into agreements with other entities (e.g., States, individuals, public and private agencies) to conduct activities to control nuisance animals, and WS may receive and retain funds provided under such agreements until expended for animal damage control activities. Approximately 58% of the current WS-Idaho PDM program is paid for with WS-Idaho's appropriated federal funds with the remaining 42% coming from cooperators.

31. Is there a canid-specific poison you could use that would be more easily or safely distributed? Primary adverse risk would be to fox.

There are limited numbers and types of toxicants registered for use on canids. These toxicants generally are not "canid-specific;" rather the application strategies for these toxicants tend towards being canid-specific. For example, the baits or lures used and the placement of the toxicant (e.g., avoiding placement in areas with sign of activity by other potentially vulnerable species) makes the application more target specific. This is the general strategy used to reduce risk to non-target animals including fox from use of toxicants.

32. Lethal methods should only be used as a last resort and should only target the animals responsible for the damage.

WS-Idaho applies an IWDM approach using the WS Decision Model (see Section 3.2.1) to reduce or prevent wildlife damage. In selecting damage management techniques for specific wildlife damage situations, consideration is given to the species responsible and the frequency, extent, and magnitude of damage. In addition to damage confirmation and assessment, consideration is given to the status of target and potential non-target species, local environmental conditions, relative costs of applying management techniques, environmental impacts, and social and legal concerns. These factors are evaluated in formulating management strategies, giving preference to available and effective nonlethal strategies, and often include the application of multiple techniques. Typically, multiple nonlethal strategies have previously been deployed by the resource owner prior to requesting WS-Idaho assistance with lethal methods.

33. Program is not successful because after decades of killing problem still exists.

This belief and argument is founded upon a misunderstanding of the mission and goals of WS. WS responds to individual depredation events to assist in resolving those conflicts, then addresses the next conflict as requested and funded. Given the analysis in Chapter 4 of the EA that indicates predator populations quickly recover from removals by WS-Idaho, this approach does not guarantee predation events will not recur at some later point (WS does provide technical assistance on methods that make it less likely for predation to reoccur (e.g., fencing, habitat management, livestock husbandry practices, livestock guarding animals) where applicable). Nor is it reasonable to assume that localized actions to target specific depredating animals or small groups of animals would impact losses elsewhere in the state. In conducting work in this fashion, WS-Idaho can confidently support the evidence that our actions have no significant impact upon overall predator populations. The reasoning presented in this comment is analogous to claiming that mowing a lawn is ineffective because you will only need to mow it again. Many nonlethal methods may also need to be repeated (use of frightening devices) or sustained over time (livestock guarding dogs, fencing, herders) for efficacy, yet these methods are also seen as effective.

34. Aren't private organizations and state agencies providing funding to help ranchers to effectively use nonlethal methods?

WS-Idaho is aware of only two sources of funding to help producers in Idaho implement nonlethal PDM methods, one for wolf damage management and one for grizzly bear damage management. Some funding for implementation of nonlethal methods for wolf damage management is available through the Idaho Governor's Office of Species Conservation, but wolf damage management is outside the scope of this EA. Defenders of Wildlife has collaborated with states on a Grizzly Bear Electric Fencing Incentive Program designed to reduce conflicts with small livestock and backyard chicken operations. In this program, Defenders provides technical assistance and up to 50% of cost (up to $500) for bear resistant electric fences. However, as shown in NASS livestock loss data for Idaho (Tables 1.3 and 1.4), conflicts involving grizzly bears only involve a small portion of total conflicts with predators addressed in this EA.

35. Predators play an important role in ecosystems and should not be killed to enhance game species populations or protect livestock on public land. Lethal methods are only acceptable in situations where there is well established scientific justification (including biological consensus) for removals to protect T/E species.

WS is authorized by Congress to provide assistance to the public with wildlife conflicts impacting a variety of human interests, which include economic and biological resources. We agree that predators play a vital role in a healthy ecosystem. Therefore, program planning, delivery and effects are carefully monitored and coordinated with wildlife and land management agencies to ensure that ecosystems are not adversely affected. The cumulative effect of the WS-Idaho's PDM activities on predator populations and their ability to sustain harvest and other removals, as is evaluated in Chapter 4, effects on target species and non-target species, is very low.

Requests for assistance with threats to T/E species that would warrant use of lethal methods under the current program (Alternative 1) are uncommon and usually very limited in the scope of the area to be treated. The decision to use or test PDM methods to protect T/E species is made by the agency with authority for managing the species in question, usually the USFWS, but possibly a tribe or other agency in consultation with USFWS. Given the importance of protecting T/E species, these types of projects would be conducted by the management agency, using methods that are available to them, which may be fewer than those available to WS-Idaho, if WS-Idaho cannot provide assistance. Consequently, impacts of a "Nonlethal with Lethal to Protect T/E

Species" alternative would be virtually identical to Alternative 3 – Nonlethal Management Only, and analysis of this alternative will not provide substantive new information. Consequently this alternative will not be addressed in detail.

36. Is there information to support the assertion that lethal PDM methods by non-WS entities under Alternatives 2 and 3 would approach levels conducted by WS-Idaho under Alternatives 1 and 5?

Yes: Alternative 5 is similar to Alternative 1 except that it would involve increased PDM by WS-Idaho for the protection of natural resources, specifically, increased use of DRC-1339 for the protection of sage-grouse from predation by ravens. Projects for the protection of natural resources are entirely paid for by the agency requesting the project, so there would be no difference in funding available for this type of work under any of the alternatives. At the time the EA was initially prepared, WS-Idaho was the only entity able to use DRC-1339 in egg baits to remove ravens for the protection of natural resources as would be conducted under Alternative 5. However, in 2014, ISDA issued a Special Local Need FIFRA registration to IDFG allowing IDFG personnel to use DRC-1339 to protect natural resources, which allowed IDFG to implement its sage-grouse protection study in 2015 without WS-Idaho's assistance. At this time, WS-Idaho continued to implement Alternative 1. IDFG would be able to conduct its sage-grouse study no matter, which alternative was selected by WS-Idaho.

We have added additional information substantiating the conclusion that total PDM activities under Alternatives 2 and 3 would be similar to Alternative 1 to the description of methods in Section 3.2. In brief, there is already evidence that producers have the capacity to conduct their own PDM. Under the current program (Alternative 1), not all producers use WS-Idaho to resolve their damage problems. Some producers conduct lethal PDM on their own, and others hire private contractors or use friends and volunteers to remove predators when they feel action is warranted, including the use of aerial shooting. Currently there are 19 permits issued within Idaho for private individuals to conduct aerial shooting operations (S. Boyd, ISADCB, pers. comm. 2016). Aerial shooting activities on public lands are not restricted to WS and may also legally be conducted by non-federal entities with applicable permits for aerial shooting. Some methods, such as M-44s, livestock protection collars (LPCs), and DRC-1339 for reduction of predation on livestock are restricted to use only by WS-Idaho. However, applications of these methods under Alternative 1 are relatively limited and, with the possible exception of raven take with DRC-1339 could be replaced by increased use of alternative methods by non-WS entities, including foothold traps, cage traps, snares and shooting. DRC-1339 for the protection of livestock and agricultural resources is still restricted to WS and to the IDFG with their 24c registration of the product. Take of ravens with DRC-1339 is more efficient than other methods. The level of raven take under Alternative 1 is high enough relative to raven take by other entities that it is possible non-WS entities may not be able to take as many ravens as WS-Idaho (Section 3.2.2).

Some individuals have questioned whether the loss of federal funding would reduce the level of lethal PDM conducted in the state. Federal funds are a substantial portion of the current PDM program in Idaho. Approximately 58% of the current WS-Idaho PDM program is paid for with

WS-Idaho' federal funds with the remaining 42% non-federal funds. WS-Idaho budget data indicate total federal appropriated contributions to the FY 2015 WS-Idaho PDM program (excluding wolf damage management) were approximately $692,100, or 58% of total program cost. This is the funding needed to completely replace WS-Idaho (nonlethal and lethal methods combined). The actual cost of lethal PDM assistance would be lower because, some WS-Idaho federal funding is used for technical and operational assistance with nonlethal methods.[25] Comparison of WS-Idaho field staff salaries to salaries of equivalent state field personnel indicates that state salaries are approximately 20% lower. Additionally, WS-Idaho operates under more stringent training and safety standards than private industry does for aerial operations that are established through the WS Aviation Training and Operations Center's Aviation Operations and Safety Manual (USDA 2015).

Although federal funds are currently directed to PDM in Idaho, there is reason assume that the state could make up for the loss of federal funds through a variety of methods. An example from South Dakota (see Section 3.2.2) shows how states can find ways to obtain funding for PDM when federal funding is not available – in this case through sportsmen's license fees. Recently, the State of Idaho was able to allocate $500,000 just for wolf damage management when USFWS federal funds for wolf damage management were no longer available. Instead of, or in addition to finding funds for PDM, the State could also implement a variety of administrative solutions such as developing a system of volunteers to conduct PDM actions like the one implemented by the State of Minnesota to address wolf damage management while wolves were federally delisted. Therefore, we believe that although there may be a short-term reduction in lethal PDM activities in the absence of lethal assistance by WS in Idaho while alternative sources of PDM assistance are identified, use of lethal PDM is likely to return to levels similar to that of the current program. We further emphasize that shifts in the entity conducting lethal PDM would have consequences in terms of impacts on target and non-target species, safety, and communication and consultation with the public and tribes that have been addressed in the EA (See Sections 4.2.2 and 4.2.3).

37. WS should not kill dogs. Why are you killing dogs?

WS-Idaho does not target domestic dogs unless it has been established that they are responsible for agricultural damage or threatening human health and safety, and are feral/free-ranging dogs. On rare occasions, WS-Idaho may unintentionally capture or kill a free-ranging dog (feral or not) while conducting PDM actions (EA Table 4.2.1.2). WS-Idaho implements a range of strategies to reduce risk of unintentional take of dogs including a policy of not using M-44s on public land that will be implemented in response to analysis in this EA, posting warning signs at major entry points to areas where traps or snares are being used, and avoiding use of devices that could capture dogs in areas frequently used by the public and their pets. Free-raging pets bearing identification that are captured in WS devices are returned to the owner or transferred to local animal shelter.

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[25] The WS MIS and financial system record activities by project/cooperator and do not record time spent using specific methods, so total expenditures on use of lethal vs nonlethal methods are not available.

38. Is proposed application of DRC-1339 in violation of the FIFRA label requirements because WS says it will only pre-bait and monitor "most" sites before treating and because livestock and people can access the sites? Commenters were particularly concerned about Birch Creek Watershed area identified in the IDFG raven control study plan.

Statements regarding pre-baiting were made in reference to an erroneous statement in a proposed supplement to an older WS-Idaho predator EA (USDA 2002a) that was not finalized. The label requirements for use of DRC-1339 egg baits for the protection of natural resources have been recently revised and approved by EPA. The current label stipulates that:

- DO NOT apply treated baits within 50 feet (15.2 m) of permanent manmade or natural bodies of water, unless baited sites are under constant observation while baits are exposed.
- DO NOT exceed a maximum application rate of 0.083 lbs of active ingredient per acre (0.93 g active ingredient/100 m2), or a maximum yearly application rate of 0.5 lb of active ingredient per acre (5.61 g active ingredient/100 m2).
- DO NOT store treated bait in locations accessible to children, pets, domestic animals, or non-target wildlife.
- Prior to application, and during the time between the conclusion of application and the disposal of unconsumed bait, DO NOT temporarily place treated bait in locations accessible to children, pets, domestic animals, or non-target wildlife. Follow the directions in "ENTRY RESTRICTIONS" to avoid exposure to children, pets, or domestic animals during application. Follow the directions in "PRETREATMENT OBSERVATIONS" to mitigate exposure to non-target wildlife during application.
- DO NOT apply bait in a way that will contact workers or other persons.
- DO NOT use treated baits as food or feed.
- DO NOT apply baits made from this product in any way that could contaminate human food or animal feed.
- ENTRY RESTRICTIONS:
    - Only protected applicators may be in the area during bait application. Keep pets and livestock, and persons other than authorized handlers away from the bait at all times, and exclude all unauthorized persons from application sites during prebaiting and baiting. For example, post signage near, in the vicinity of, or at main entrances or commonly used access points to prebaiting and baiting sites that warns persons not to pick up or handle any baits and to keep pets and livestock away from bait.
- PRETREATMENT OBSERVATIONS:
    - Prior to application, carefully observe target birds' feeding habits to locate their preferred feeding sites, determine the optimum time of application, and evaluate potential hazards of the application to non-target and protected species.
- PREBAITING:
    - Prebaiting with untreated bait materials (or use of a draw station) is necessary to promote feeding by target species and to assess potential for exposure of non-target species. Apply prebait using the same procedures that are prescribed below

for the type of bait ("EGG BAITS" or "MEAT BAITS") that is to be used for toxic baiting.

- Observe baited areas (from blinds) early in prebaiting period to determine whether non-target species are approaching baits. Haze away Threatened or Endangered and non-target species that might consume baits. Remove baits if such non-target species continue to approach them.

WS-Idaho will comply with all requirements of the label including working with land managers and cooperators to ensure that livestock are kept away from treated bait and by posting appropriate warning signs in areas were baits are being used to protect natural resources (e.g., raven removal for sage-grouse protection.

39. Would WS actions violate the DRC-1339 label clean-up requirements in the Idaho National Laboratory (INL) because there are some places they cannot go in the INL to pick up carcasses? Is WS violating the label requirements to recover and dispose of carcasses because it does not know where the majority of dead birds will be and cannot find the carcasses?

WS would comply with the label restrictions pertaining to Post-Treatment Clean-up requirements. Comment is based on an erroneous interpretation of a January 24, 2014 memo from J. Depperschmidt, DOE-INL to A. Moser (IDFG) regarding access to the INL for the sage-grouse protection study. The memo provides reporting, safety, communication and coordination requirements for personnel working in the INL, but does not list any site restrictions. A May 13, 2014, follow-up email from J. Depperschmidt, INL, to G. Graves WS indicates that the comments in communications between Mr. Depperschmidt and Ms. Moser were taken out of context and that DOE was not going to dictate whether WS picks up carcasses or not.

POSTTREATMENT CLEAN-UP (Meat and Egg Baits):

> **NOTE: During clean-up, wear long-sleeved shirt and long pants and chemical-resistant gloves (such as waterproof or rubber gloves).** To further reduce the potential for exposure, use appropriate implements such as scoops or other tools to collect carcasses or uneaten bait.
>
> Collect unconsumed and leftover meat daily, and unconsumed and leftover egg baits, dying birds, and carcasses within 7 days of treatment. Dispose of such baits and carcasses by burning or burial, as authorized by applicable laws and ordinances.

The label text quoted above acknowledges that not all areas surrounding the treatment site may be accessible and not all birds may be located (i.e., *if accessible*).

40. Will there really be 14,000 egg baits placed in 14,000 locations at one time for raven control?

No; the number of eggs for the IDFG study to evaluate raven control to protect sage-grouse is based on a maximum of 7,000 eggs per year for each of 2 years of the study (IDFG 2013a). This is the maximum number of eggs that could be placed, and in all likelihood, because raven numbers vary and some locations within the project areas are unsuitable for bait placement, fewer eggs would be placed. Two eggs would be placed in each location, so there would be a maximum of 3,500 "sets" of egg baits. Not all eggs would be placed at the same time. The total number of baits estimated by IDFG includes retreatment of sites. DRC-1339 breaks down relatively rapidly in moist and hot conditions. Treated eggs are only likely to be effective for up to one week with shorter intervals likely under hot weather (J. Spencer, District Supervisor, WS, Reno, NV pers. comm.). The actual number of bait "sets" that are out at one time is unlikely to exceed 1,100 sets, which when divided among one site with an area of 437 mi^2, one site with an area of 265 mi^2 and a cluster of 3 smaller sites with a total area of 445 mi^2 would result in an average application rate of approximately one bait set of two eggs per square mile. Bait sets will not be evenly spread throughout the project area. However, as noted in Section 4.2.5.6, the number of treated eggs placed per square mile (640 acres) would most likely never exceed 14 at any one time. The label for DRC-1339 stipulates that no more than 18 eggs may be placed in a 25 ft. radius circle (treatment site). However, based on experience with use of this method, lower densities are used in projects to control raven predation on sage-grouse to limit the eggs available to raven pairs, and minimize the chance of a raven pair caching treated eggs for later consumption.

41. WS is often the first responder to a damage complaint so WS is the ideal agency to promote use of nonlethal methods. WS needs to prominently adopt this role in Idaho.

As noted in the EA, under Alternatives 1, 3, 4 and 5, WS-Idaho would continue to provide cooperators and the general public with technical assistance on use of nonlethal strategies to prevent or reduce conflicts with predators in Idaho, and WS-Idaho would give preference to use of nonlethal methods where practical and effective (WS Directive 2.101). In 2015, WS-Idaho sponsored a workshop in Cambridge, ID for livestock producers on nonlethal methods to reduce predation on livestock (approximately 65 local livestock producers attended) and will sponsor additional workshops in the future. A 2015 NASS report on sheep losses to predators and producer use of nonlethal methods showed that Idaho sheep producers used nonlethal methods at a higher proportion (67%) than the national average of 58% (NASS 2015, K. Marshall, APHIS Veterinary Services, unpublished data).

42. Idaho law provides that "it is the obligation of landowners to take all reasonable steps to prevent property loss from black bears, grizzly bears or mountain lions or to mitigate damage by such" so it is more than reasonable to require WS to document that the landowner has implemented these measures. Evidentiary support for all claims that producers have tried nonlethal techniques before requesting assistance from WS would ensure that appropriate nonlethal methods are being used and would provide opportunity to trouble-shoot use of nonlethal techniques, which may be improperly implemented or used in the wrong scenario.

The statute cited, Idaho Code Section 36-1109, starts by saying (emphasis added), "[p]revention of depredation shall be a priority management objective of the *department*," referencing IDFG. As such, it would be the obligation of IDFG, not WS, to determine any record-keeping obligations of landowners. None of the alternatives except Alternative 4 would require livestock producers to implement nonlethal methods prior to receiving assistance from WS-Idaho with lethal methods. Under all alternatives, WS-Idaho recommends nonlethal methods where practical and effective. Most producers who request WS-Idaho assistance with PDM have tried or are currently implementing nonlethal PDM practices, and have found these methods to be ineffective to some degree. WS-Idaho collects information on producer-implemented nonlethal methods in the State and anticipates that it will be able to access comprehensive records of producer-employed nonlethal methods in Idaho by the end of FY 2016.

43. The Decision Model fails to provide adequate information, including information on how success will be measured and what the results have been in the past.

We do not agree. The WS Decision Model (Slate et al. 1992, and WS Directive 2.201 as cited in the EA) and WS Directive 2.105 describe the thought process that guides WS though the analysis and development of the most appropriate individual strategy to reduce damages and detrimental environmental effects from damage management actions within the confines of the EA. The thought process includes consideration of the various factors of the circumstance (e.g., the species responsible for the damage, magnitude of the damage and continued threat, what strategies have been successful or not successful in the past, potential risks to the general public or non-target species for various tools). As control actions have been implemented, the WS Decision Model continues the thought process to evaluate the success of the strategies used, potential of other alternatives if the current strategy(ies) are not successful, and modifications to the control effort if damage is continuing to occur in order to resolve those ongoing conflicts. WS-Idaho's on-the-ground decision-making process is explained in the EA (see Section 1.6.6 and 3.2.1), and the effects of the alternatives--past, present and reasonably foreseen--are adequately evaluated in the EA (see Chapter 4).

Project goals are established collaboratively with each cooperator during initial meetings when WS-Idaho staff meet to assess the damage and identify potential strategies to reduce or stop the conflict. Project success is evaluated in context of the established goals during project implementation as noted in the WS Decision Model. Additionally, WS-Idaho meets with the major stakeholders of the PDM program annually, including the IDFG, ISADCBs, County Commissions, and tribes. Summary program reports of the activities are presented for their review. WS-Idaho invites feedback on where WS-Idaho activities may be improved and the direction they would like us to proceed to best meet their needs for the coming year.

ISSUES PERTAINING TO ASSESSMENT OF ENVIRONMENTAL CONSEQUENCES

44. Please provide information on direct indirect and cumulative effects of DRC-1339 especially relative to risks to T/E and other non-target species.

Effects of DRC-1339 are addressed in detail in Section 4.2.1.1 Effects on Target Predator Species Populations; Section 4.2.1.2 – Effects on Non-target Species Populations, Including T/E Species.

45. The list of species killed by DRC-1339 include savannah sparrows, killdeers, mourning doves, meadowlarks, American pipits, northern cardinals, horned larks, herring gulls, ring-necked pheasants, American robins, American tree sparrows, Canada geese, mallards, northern flickers, downy woodpeckers, dark-eyed juncos, green-winged teals, song sparrows, vespers sparrows, grasshopper sparrows, field sparrows, and rock doves. Why aren't these addressed in the EA?

The list of non-target species above is from a compilation of species (Johnston et al. 2005) observed in the area of projects involving an application of DRC-1339 substantially different from that proposed in this EA, specifically, the use of grain baits in fields to reduce blackbird damage. These species were observed in the areas where untreated (Linz et al. 2002) or treated (Custer et al. 2003, Pipas et al. 2003) baits were placed in fields and is not a list of species killed, but rather a list of species that were observed in the vicinity of the application. In accordance with label requirements, pre-treatment is conducted to monitor for non-target species so that baiting strategies may be developed to minimize potential exposure. None of the species listed above is likely to consume egg baits. Use of DRC-1339 proposed in the EA and associated provisions for reducing risk to non-target species are substantially different from that in Johnston et al. (2005) (e.g., use of egg baits and the close monitoring of any other baits to ensure they are not consumed by non-target species). Risks to non-target species from the use of DRC-1339 is addressed in Sections 4.2.1.2 and 4.2.1.5.

46. What provisions are being made to make sure that site access for pre-baiting, delivery and monitoring of egg baits, and conducting other PDM actions will not adversely affect sage-grouse breeding, nesting and brood-rearing behavior?

The majority of egg bait placement would occur just prior to sage-grouse nesting season to maximize the likelihood that raven population reductions will last for the duration of the period when nests are most vulnerable. Some treatment will continue throughout the nesting season as needed based on observations of ravens at project sites. Sage-grouse tend to use the same general lek sites (areas where birds gather to display and engage in courtship behavior) in consecutive years, and WS-Idaho would avoid placing baits in close proximity to lek sites during times when leks are in use. WS-Idaho would consult with land managers, landowners, and researchers (when applicable) regarding any known nest locations and avoids placing eggs near known nests. When nest locations are known, distancing pre-baiting sites from nests can help to lure ravens away from nests, and reduces the risk that baiting activity will disturb nests (Spencer 2002). Research projects monitoring predation on sage-grouse nests set up cameras within 0.5-1 m from active sage-grouse nests (e.g., Coates et al. 2008, Lockyer et al. 2013). This is considerably more intensive disturbance than would be caused by a WS-Idaho employee passing through to place and retrieve eggs and monitor for dead ravens. To minimize risk of egg mortality or nest abandonment, researchers did not place cameras during times of snow, rain, high winds or extreme ambient temperatures. Coates et al (2007) compared nest success and predation rates for nests with and without cameras and did not detect any evidence that camera placement adversely affected daily survival rates of nests. Similarly, Lockyer et al. (2013) reported that camera installation at nests did not cause nest abandonment insofar as recorded females returned to nests and resumed incubation in all cases after camera placement. Similarly, WS-Idaho would not place egg baits during periods of snow, rain, high winds, or extreme ambient temperatures. Periodic placement of egg baits is less likely to result in direct interaction between staff and sage-grouse nests than the research projects, especially given that most of the treatments are expected to occur just prior to sage-grouse nesting and staff are purposefully looking for active nests to avoid, rather than to observe. Based on this information, placement of eggs is not likely to result in sufficient disturbance of nesting sage-grouse to cause nest abandonment or reduce nest success.

47. Is the risk of secondary toxicity to eagles and other raptors from the proposed use of DRC-1339 understated in the EA? In a 1995 report, the USFWS reported mortality of a peregrine falcon near a site DRC-1339 treatment site and expressed concerns about risks to eagles.

The EA does not understate the risk of secondary toxicity from use of DRC-1339. The issue of secondary toxicity from use of DRC-1339 is addressed in Sections 4.2.1.2 and 4.2.5.2. This comment appears to be in reference to USFWS BOs prepared by the NWRC in 1995 and 1998 for research projects on the use of DRC-1339 to reduce blackbird damage to sunflower seed crops using baited grain. Subsequent review of the information in the North Dakota 1998 BO by WS indicates the BO may have overstated the situation with the peregrine falcon. A consultation was conducted with the USGS National Wildlife Health Center (NWHC) in Madison, Wisconsin, which conducted the necropsy on the peregrine falcon. NWRC records indicate that in 1993, a peregrine falcon was observed feeding on pigeons in Porter County, Indiana and was later found disoriented (T. Pugh, WS, pers. comm.). There was no further background information submitted with the bird. There is conflicting information between the record of the conversation with the NWHC and material submitted in the 1995 and 1998 BO. The conversation record with the NWHC indicates there no information was provided on pesticide use in the project area and that the submitter suggested testing for a different avian toxicant, Avitrol. The BO cites an individual as stating that the site was baited with DRC-1339 for starlings. NWHC tests for Avitrol were negative, but there was widespread kidney damage. The NWHC noted that whenever kidney damage was observed it raised the issue of Starlicide™ poisoning (Starlicide™ has the same active ingredient as DRC-1339 and is available to registered pesticide applicators – not just WS). Starlicide causes specific types of damage to the kidney and almost always causes visceral gout. Further testing of the kidney was impossible due to its poor condition caused by post-mortem necrosis and freezing. Visceral gout was not present, which is expected with Starlicide poisoning and this was noted in the necropsy report. The lack of visceral gout tends to suggest Starlicide was not the cause of death.

WS attempted but was unable to locate the 1995 USFWS biological opinion referenced, but was able to locate a 1998 biological opinion from the same USFWS office for a similar project testing DRC-1339 in the same general area as the 1995 project and an earlier 1993 project. These projects were intended to test the efficacy of baited grain placed in sunflower fields to target flocks of blackbirds depredating the fields. Both the formulation and application protocol for the bait, and the number, type and distribution of birds that could be taken is very different from the baited eggs and meat baits proposed in this EA. Moreover, despite decades of use of DRC-1339 by WS and use of Starlicide™ (same active ingredient as DRC-1339) by registered pesticide applicators, there have been no other reports of secondary toxicity to eagles and raptors. Therefore, based on this information and the information presented in the EA, risks of secondary toxicity to eagles and other raptors are negligible.

48. Unintentional mortality of non-target wildlife and domestic animals is unacceptable.

We agree that unintentional mortality of wildlife and domestic animals is always undesirable. Measures taken to minimize risks to non-target animals are discussed in Sections 3.4.2.2 and 4.2.1.2 and 4.2.5.2 of the EA.

49. Will the PDM program have indirect benefits to wildlife?

The EA sections on "Effects on Non-target Species Populations, including T/E Species" for each of the alternatives analyzed in Chapter 4 consider indirect benefits to wildlife and WS has concluded that the PDM program will not have significant indirect benefits to wildlife. As noted in Chapter 1, relationships among predators and prey are complex, and even PDM projects specifically intended to enhance prey populations may not always have the intended consequences. Effective programs to benefit species of wildlife identified by state, federal and tribal wildlife management agencies are generally conducted in specific critical seasons and locations that are most likely to benefit the species to be protected (e.g., during periods and locations of birthing/nesting and when vulnerable juveniles are present). PDM conducted for livestock protection is usually of lower intensity than projects for the protection of sensitive wildlife species and may not be conducted at optimal times and locations to benefit wildlife. As noted in the EA Chapter 4 sections on effects on target predator populations for each alternative, cumulative impacts of Idaho PDM activities are generally low relative to other known sources of mortality and total population sizes, and/or are within sustainable harvest thresholds identified for the target species and will not cause sustained predator population declines. Due to immigration and compensatory mortality and natality, local population declines resulting from PDM are localized, short-term and unlikely to last for the duration of a year. Consequently, although PDM for livestock protection has the potential for some indirect benefits to wildlife (Dinkins et al. 2016, any potential benefits are likely to be limited and highly localized.

50. Is it appropriate to consider whether depredation on livestock is humane when evaluating the humaneness of PDM? These animals are just going to be killed for food anyway.

The well-being and humane treatment of all animals, including animals used for food, is an important issue for many members of the public and is a driving force behind organized movements to end the use of gestation crates for domestic swine, improved conditions for chickens, investigations of feedlot and slaughterhouse conditions for all domestic livestock. The fact that an animal will ultimately be used for food does not exonerate livestock producers from seeing to an animal's wellbeing and safety while under their care or negate a producer's concern for his or her animals.

51. The EA needs a more comprehensive analysis of cost:benefit ratios to include existence value and non-consumptive value of animals killed by WS-Idaho, and impact of loss of

wildlife on non-consumptive wildlife-related industries. Analysis needs to consider economic factors listed by Loomis (2012) including benefits to society from predators, and economic information provided during scoping by Western Watersheds Project. Will WS spend $1,000 responding to the loss of a $100 lamb?

The EA uses the best available information to assess the benefits to society from predators and the impacts on non-consumptive wildlife related industries. We have added additional data on the economic benefits from consumptive and non-consumptive recreation to the Idaho economy to the EA at 4.2.1.5. Hunting and wildlife watching contribute substantially to the Idaho economy. In a nationwide survey of hunting, fishing, and wildlife-associated recreation, 246,000 hunters contributed an estimated $478 million in total expenditures to participate in hunting in Idaho and 558,000 wildlife watching participants (some hunters engage in both types of recreation) contributed approximately $430 million in total expenditures to participate in wildlife watching in the State. These expenditures occurred with the current PDM program (Alternative 1) in place.

- Loomis criticizes the Bodenchuk analysis because it contains a "multiplier effect" within its analysis. Regardless of the validity of this effect in an analysis, they skip over the results of the conclusions. They conclude that the CBA result "27:1 is an overstatement by a factor of three just from his application of the multiplier of three to benefits". If that is true, then the results still would have shown a 9:1 cost benefit ratio.
- Loomis (2012) does not include consideration of the fact that there is strong evidence that PDM would continue without WS actions. They argue that if WS kills a predator, there will be a loss in opportunity costs by society, but ignore the fact that without WS, those opportunities would likely be diminished in the absence of lethal PDM by WS-Idaho. Larson (2006) documented that following the cancellation of WS services in Marin County, CA, estimated annual take of coyotes by private citizens greatly exceeded that which WS took in that county. The primary difference between WS and no WS is that the general public would have no knowledge of coyote take because private citizens have no reporting requirement for that type of take. Loomis (2012) also fails to consider the impact of WS take relative to take by licensed hunters and trappers. As noted in Chapter 4 sections on impacts to target species, for most species addressed in the EA, WS-Idaho's take levels are a small fraction of total take. When WS take is a low portion of total allowed take it is unclear whether take by WS would result in a detectable impact on societal costs associated with predator removals.
- In the Nevada WS CBA, Loomis argues hunter valuation by attempting to ignore economic value of supplies purchased because not all purchases are made within the state where they are hunting. Those expenditures become an economic gain wherever they may occur. The American economy is not a closed system established by state boundaries. With that way of thinking, then would the value of the knowledge of existence be diminished or subtracted from the equation for anyone that lives outside the state?
- Loomis criticizes ex-post CBA attempts to devalue historical analyses rather than performing a prospective CBA. The ex-post analysis is valuable because more hard numbers may be used within the analysis rather than depending upon speculation, which is far more open to criticism.

- Loomis criticizes the WS-California CBA and indicates that federal funds were not inclusive in the analysis. Historically, the PDM program in CA was funded with cooperator funds and did not use federal allocations. Now, they do cost-share and should they perform another similar CBA, those federal allocations used to support that program would be included within that analysis.

The available studies do address the issue of cost of PDM directly related relative to the protection of livestock, which is a commonly expressed concern (See Response 5 above). To date, no studies are available that contain this combination of information for PDM programs, although qualitative review of these factors is possible and is contained in the EA within the Section 4.2 where issues are analyzed in detail in the context of the review of impacts on recreation and other sociological values and the impacts to target and non-target species and ecosystems.

Comparisons of livestock losses to existing program costs in a system with an ongoing PDM program are not a valid measure of the efficacy of the PDM program. As noted in Response 5, the issue is not the amount of PDM that occurs, but the level of loss prevented. In an extreme example, using the flawed reasoning presented by commenter, a program that was 100% effective in reducing predation would compare no losses to predators to program costs and could not be cost effective. Predicting the level of loss that might have occurred in the absence of a PDM program is challenging. Few producers are willing to allow predation to occur without responding, even if losses are compensated. Past studies that have attempted to assess losses in the absence of a PDM program have exceeded the level of compensation funding which precipitated a change in the experimental design of the projects (O'Gara et al. 1983).

52. The EA needs to consider the economic consequences of individuals choosing to avoid recreating in Idaho because lethal PDM methods are used on public lands, including review of the recent predator derby in Idaho (Jones 2014).

The WS-Idaho PDM program has been in place for decades and has been repeatedly commented on in public forums. As such, long-term potential impacts of individuals choosing not to visit Idaho have already been incorporated into the existing environment. WS is not aware of any recent documentation that these trends have changed. Moreover, similar WS PDM programs exist in all surrounding states (e.g., Montana, Utah, Oregon, Wyoming, Washington, and Colorado). Consequently, individuals choosing to avoid Idaho because lethal PDM is conducted on public lands would need to forego recreation in this region altogether. The number of individuals likely to forgo all recreation in the western U.S. because of PDM programs is likely to be low and would not have a significant impact on local economies.

Jones (2014) is irrelevant to the EA because it reviews a predator hunt derby, in which individuals boycotted an area because it allowed a novel and advertised event in a specific location. In contrast, use of lethal PDM methods by many entities including WS-Idaho is dispersed throughout the state on private, state and federal lands. Any associated economic consequences of a boycott are also likely to be dispersed and are likely to be small. Finally, WS-

Idaho actions target specific wildlife conflicts. The Sections on "Humaneness and Ethical Perspectives" for each of the alternatives analyzed in Chapter 4 acknowledge that some individuals strongly oppose lethal PDM particularly on public lands. However, public tolerance of lethal methods to reduce damage tends to be greater than for use of the same methods strictly for recreational purposes (e.g., the predator derby), or to harvest animals for food or fur (Koval and Mertig 2004, Andelt et al. 1999, Manfredo et al 1999).

Jones (2014) is also irrelevant to the analysis because, as noted in Sections 3.2.2 and 3.2.3, use of lethal PDM methods to reduce predation on livestock is likely to persist even if WS-Idaho's use of such methods is reduced or discontinued altogether. Many individuals who express a desire to avoid Idaho in opposition to the current and proposed future use of lethal methods for PDM on public lands appear to be basing their statements on strongly held perceptions regarding the appropriateness of lethal methods, regardless of which entity applies the methods. As a case in point, the Jones (2014) paper assessed the use of lethal methods by private individuals, not WS. The relatively minor or short-term differences in use of lethal methods among the alternatives, when actions by all entities (WS, other agencies, tribes, private) are considered, may be insufficient to shift recreational choices by individuals who choose to boycott the state because lethal PDM methods are used on public lands in Idaho (as well as elsewhere in the region). Further, some individuals may find that a non-WS entity using lethal PDM methods is more disturbing than the current program (Alternative 1) because of concerns that, without public disclosure provided by WS in their NEPA documents, the public would have even less information on what lethal and nonlethal methods are used and where they are used, as those entities are not required to comply with NEPA.

WS-Idaho has decided not to use M-44s and LPCs on public lands. No other entity has authorization to use either technique in the state. The only lethal PDM method that could be used by WS-Idaho on public lands that might not be available if WS-Idaho selects Alternatives 2 or 3 would be DRC-1339 in egg baits for the protection of sensitive species as identified by IDFG or USFWS, as would occur under Alternative 5. However, at present, the State of Idaho has a Special Local Needs FIFRA registration to use this method for the protection of sensitive species. It is likely that magnitude, nature and location of this type of lethal PDM action, and associated public response, would not change substantially from the current program. Implementation of PDM programs to protect threatened and endangered species and game species are specifically intended to increase consumptive and non-consumptive opportunities to view and enjoy the species to be protected. Any potential increases in boycotts of Idaho that might result from implementation of Alternative 5 are likely to be offset by increases in visitation by individuals seeking to take advantage of increased opportunities to hunt and view the species which are being protected.

Given the information above, any consequences of boycotts due to the use of lethal PDM methods on public lands are expected to be minor, dispersed throughout the state, and will not vary substantially among the alternatives.

53. Is the EA too dependent on studies published prior to the 1960s?

The EA uses the best available information, which sometimes includes information from older studies. WS has reviewed all older studies in the EA. Where older references provided general background information (e.g., food habits, general biology of a species) that were not substantively different from newer references, the older references were replaced with newer references. These replacement studies did not substantively change the nature of the data presented. The remaining older studies were retained because they provide background or historical information relevant to the analysis, show trends in information over time, or present the best information available on an issue. Funding for wildlife research is limited and, recognizing the myriad of factors affecting ecosystems and the animals that are components of those ecosystems, very difficult and costly to conduct with any degree of evidentiary certainty. Studies are not repeated unless there is substantial interest in the topic and a compelling reason to re-examine the issue. Consequently, the best available information on a topic, such as the efficacy of a specific management device from older publications may still be valid.

54. Does the EA fail to consider baseline conditions? Should the baseline be the status of the environment in the absence of, or even with lower levels of PDM, if others "would likely" conduct the action in the absence of WS-Idaho?

CEQ provides two distinct interpretations of "no action" for the purposes of NEPA analyses. In the first case, for new projects which have not been initiated, "no action" refers to situations in which the proposed action would not take place. The second interpretation involves ongoing federal programs such as the WS PDM program in Idaho and may be defined as "'no change' from current management direction or level of management intensity." (CEQ 1981). For a program that has been in effect for over 20 years, such as the PDM program by WS-Idaho (USDA 1996 and USDA 2002a as amended), the environment and activities associated with current WS-Idaho PDM activities is the environmental baseline. An environment with no WS-Idaho in it would be a choice that changes baseline conditions and has been analyzed in this EA as such. CEQ also states that when a choice of "no action" by the agency (in our case - no PDM by WS-Idaho) would result in predictable actions by others, this consequence of the "no action" alternative should be included in the analysis. As noted in Response 36, WS believes there is sufficient reason to conclude that lethal PDM actions by entities other than WS-Idaho under Alternatives 2 and 4 would be similar to lethal PDM actions by WS-Idaho under Alternatives 1 and 5 (except for use of some methods as discussed in Section 3.2.2. and Response 36).

55. EA needs to consider risks to public and pet safety associated with M-44s. Risks associated with M-44 use on public lands needs to be considered in greater detail in light of increased recreation on public lands. Does WS-Idaho commonly misuse M-44s?

WS-Idaho has reviewed past use of M-44s in the state, M-44 use restrictions, public comments and other material presented in the EA. WS-Idaho has determined that historical use of M-44s on public lands has been very low and that the purposes of this method on public land may be met by substituting the use of other methods. WS-Idaho has determined not to continue use M-44s on public lands. Consequently, there will be no risks to public or pets on public lands from M-44s.

Commenter cited letters from 2006-2008 regarding risks and concerns associated with M-44 use. A 2009 EPA review of allegations of "common misuse of M-44s" on private lands nationwide determined that, "evidence indicates that past private property misplacements are exceptionally rare considering the total number of M-44s placed" and noted that WS had taken proper corrective action to prevent potential future incidents of private property misplacements of M-44s (EPA 2009). There have been only two instances of members of the public triggering M-44 devices since 2008, both on private land in Texas. In both instances, WS had complied with all applicable requirements for the use of M-44s. All WS employees are required to comply with EPA label use restrictions for M-44s including requirements for proper placement of signage (WS Directive 2.415, EA SOPs in Section 3.4.2.6). Based on this information and information presented in the EA, WS-Idaho proposed use of M-44s does not present a significant risk to the public.

56. Has WS addressed historic and cumulative impacts of habitat loss and habitat fragmentation in this EA?

The EA provides information on all known forms of mortality for target species addressed in the EA sections on "Effects on Target Predator Species Populations" for each of the alternatives analyzed in Chapter 4. Cumulative impacts of factors that are not quantified for Idaho, such as habitat loss and fragmentation, are reflected in population data and population trends for wildlife species in question, as recommended by the Council on Environmental Quality (*Guidance on the Consideration of Past Actions in Cumulative Effects Analysis*, 24 June 2005). Impacts of these factors will vary over time as species show different responses to these factors. Some predators such as coyotes, red fox, ravens and crows are learning to use suburban and urban green spaces and yards). Coordination with the management agencies responsible for maintaining sustainable populations of native wildlife and annual monitoring of program impacts help to ensure that changes in cumulative impacts on wildlife can be monitored over time and WS-Idaho actions and associated NEPA analyses can be adjusted as needed.

57. WS should resume preparation of annual monitoring reports and state how they will be made available to the public.

After the EA is finalized, WS-Idaho will conduct annual monitoring of program activities (See FONSI). Monitoring reports will be made available to the public upon request.

58. Do publications by Smith et al. (2015), Bergstrom et al. (2014), Wielgus and Peebles (2014), Peebles et al. (2013), Harper et al. (2008), Berger (2006), Lambert et al. (2006), and Muisiani et al. (2003) prove that lethal control is ineffective?

WS has carefully reviewed these publications and determined that they do not demonstrate ineffectiveness of lethal control. Berger (2006) was discussed in Section 2.3.7. The study documented that factors, including market price of lambs have greater impact on the sheep industry as a whole than costs associated with predation on livestock. The study does not provide information on the efficacy of lethal methods for individual producers who are experiencing damage.

The Bergstrom et al. (2014) has limited utility relative to the analysis in the EA. Bergstrom et al. (2014) mistakenly asserts that long-term reduction of predator populations is the goal of all modern PDM programs. Under this premise, Bergstrom et al. (2014) contend that WS lethal removals of predators are ineffective because they are not of sufficient intensity to cause long-term population reductions. As stated throughout the EA and specifically at Section 2.3.14, the goal of Idaho-WS PDM actions is to reduce damage, not to cause long-term reductions in native predator populations (See also Responses 18 and 33). Data indicating that Idaho-WS integrated PDM program including lethal methods can be effective is presented in the EA in Chapter 4 discussions of the cost effectiveness of PDM, Section 2.3.14, and discussions of individual PDM methods in Chapter 4 and Appendix C. Because Bergstrom et al. (2014) addresses the long-term reductions in predator populations, while the purpose and need of the EA, and the proposed alternatives, specifically contemplate short term reductions with impacts lasting less than one year, the Bergstrom et al. article is inapposite.

The Peebles et al. (2013) and Lambert et al. 2006 articles are also irrelevant to the analysis in the EA. Peebles et al. (2013) concludes that sport hunting is ineffective to reduce mountain lion predation on livestock. Sport hunting is less focused on the individual animal than targeted PDM by WS-Idaho. When used to reduce wildlife conflicts, sport hunting (as evaluated by Peebles et al. 2013) is generally intended to reduce local or regional wildlife populations. In contrast, WS-Idaho very rarely conducts lethal removal of mountain lions (FY 2011-14 average < 4 per mountain lions year), and only to remove the specific individual(s) addressed in the conflict. WS-Idaho does not practice, and does not advocate, sport hunting as a method to reduce mountain lion predation on livestock. Lambert et al. (2006) evaluated the relationship between mountain lion complaints and mountain lion population size and concluded that an increase in complaints was not necessarily an indicator of an increasing mountain lion population. Changes in population age and sex structure resulting from hunting was only one of several hypotheses presented by the authors for the increase in conflicts with cougars. However, as with Peebles et al. (2013) the primary factor driving the shift in the lion population was extensive sport hunting. Data in EA Section WS take of mountain lions ranged from 1 to 7 lions per year in contrast to 467-564 mountain lions per year by hunters. Future take of mountain lions for damage management by WS-Idaho is not anticipated to change substantially from past levels presented in the EA. Therefore, the proposed mountain lion take by WS-Idaho is not of sufficient magnitude to cause or contribute substantively to populations trends resulting from licensed hunting managed by the IDFG and will not result in an increase in conflicts with mountain lions.

Similarly, the reference to Smith et al. (2015) is not relevant to the EA because it makes a mistaken analogy to PDM. Smith et al. (2015) assesses the impact of human disturbance (development), not PDM, on mountain lion predation rates. Smith et al. notes that levels of chronic disturbance associated with development result in cougars not consuming all of their kills and an increase in the number of animals the lions killed to meet energetic demands. The study makes no reference to PDM for livestock protection as currently conducted by WS-Idaho.

We acknowledge that no one method, nonlethal or lethal, will be effective at all times or suitable for all situations. This is the primary reasoning behind WS' advocacy of Integrated Wildlife Damage Management alternatives that give preference to practical and effective nonlethal methods while still allowing access to the full range of legally-available PDM methods. Field personnel use the Decision Model (Slate et al. 1992, WS Directive 2.201) to determine the best approach to responding to or minimizing the potential for livestock losses and can develop effective site-specific management strategies that resolve conflicts while also minimizing risks of adverse impacts on the human environment.

Wielgus and Peebles (2014), Harper et al. (2008), and Musiani et al. (2005) are all specific to wolf damage management which is outside the scope of this EA. Nonetheless, we did review these studies for information which might be applicable to PDM as proposed in this EA. We have determined that all three studies are not of utility in assessing the efficacy of PDM actions conducted by WS-Idaho primarily because of disparities in the scale of the analysis and the scale of the intended impacts of PDM actions conducted by WS. Specifically, all three studies analyze impacts of wolf damage management actions at the regional scale. Use of lethal methods to reduce damage by and conflicts with predators as currently conducted and proposed by the WS program is primarily intended as a short-term strategy to reduce depredations at the specific locations where the conflict occurs. Given behavior of mammalian predators and the targeted nature of the management effort, these removals are not intended or expected to have regional-level impacts on livestock losses (Bradley et al. 2015). Consequently, it is not surprising that studies conducted to assess the efficacy of lethal removals at the regional level such as Wielgus and Peebles (2014), Harper et al (2008) and Musiani (2005) have not detected reductions in losses. Additional problems with study design, data analysis and findings of Wielgus and Peebles (2014) have also been identified during review by the NWRC (Memo from J. Young NWRC to J. Suckow, WS Western Regional Director, 8 July 2015). Difficulties with the analytical process used by Wielgus and Peebles (2014) were also identified by Poudyal et al. (2016). Consequently, we did not use findings from Wielgus and Peebles (2014) in the analysis.

59. WS-Idaho should consult with the USFWS to identify ways to reduce risks to all non-target species.

WS-Idaho has consulted with USFWS regarding methods to reduce risks to species under USFWS management authority including eagles, T/E species and migratory birds as required by federal law and stipulated in the MOU between the USFWS and APHIS. See Section 4.2.1.2 of the EA.

60. WS-Idaho cannot use findings in the 2014 BO from the USFWS because BO has major failings.

WS does not agree that the 2014 BO had major failings. However, the agencies have updated the Section 7 consultation for WS activities in Idaho, including changes in listing status for some species. The revised 2016 BO clarifies certain measures for the protection of T/E species, including grizzly bears. WS has carefully reviewed the revised BO and has determined that its overall conclusions regarding the potential cumulative impacts to federally-listed species from PDM actions have not changed from those presented in the 2014 analysis and in the EA. The results of the updated consultation are summarized in Section 1.7.2 and the 2016 BO has been added to the docket for this EA.

61. The EA should consider risks of PDM on low density predators, including wolverine, fisher and pine marten and Canada lynx. WS needs to consider that a minimum of 13 wolverine have been incidentally trapped in Idaho since 2002.

We have augmented the analysis of impacts on non-target species in include discussions of pine martin and fisher. As stated in the EA Section 4.2.1.2, WS-Idaho has had no unintentional take of pine marten or fisher and, therefore, the risks to these species from WS-Idaho activities is negligible under Alternatives 1, 4 and 5 and no further analysis is required. The EA also states that there would be no risk from WS-Idaho's actions under Alternatives 2 and 3.

The EA also considered the impacts on wolverine and the EA Section 4.2.1.2 has been augmented to clarify this issue. Commenter extrapolated estimate of non-target wolverine take from IDFG data. Risks to wolverine from fur trapping are greater than those from WS-Idaho's PDM program. WS-Idaho data indicate that WS-Idaho has only unintentionally captured 3 wolverine over the time interval identified by the commenter. Capture involved actions to address damage by wolves and not the species addressed in this EA. Two of the wolverine were released on-site, and the third was euthanized because it was determined that it would not survive if released (EA at Section 4.2.1.2). Based on WS-Idaho's history of wolverine take, the implementation of protective measures to reduce risks in areas known to be used by wolverine which are applied for PDM and wolf damage management projects, and that no wolverine have been taken since the protective measures were implemented in 2010, WS-Idaho has concluded that the proposed action will not have a significant impact on wolverine. Given the extremely low level of impact on wolverine populations from the WS-program with the current protective measures, no additional analysis is warranted. WS-Idaho has no authority over or impact on risks to forest carnivores from private hunting and trapping.

The wolverine was listed as a candidate species at the time the 2014 Section 7 Consultation was completed for WS-Idaho's statewide activities. In August 2014, USFWS determined that listing of wolverine under the ESA was not warranted, and wolverine were not included in the 2016 ESA consultation between WS-Idaho and the USFWS. This decision was overturned by a federal court decision in April 2016 (*Defenders of Wildlife v. Jewell*, Case No. 14-246-M-DLC (D. Mont. Apr. 4, 2016)). The 2014 BO issued by USFWS indicated that over the 10 year period prior to

2014, three wolverine had been unintentionally captured by WS-Idaho. All three wolverine had been captured in foothold traps set to capture wolves. All three wolverine were captured in a localized area on the Payette National Forest. WS-Idaho has implemented several preventive measures in this area, including placing traps away from carcasses, not using musky or castor-based lures and, prior to placing predator capture equipment, conducting a site investigation to check for sign of wolverine presence. If the area is actively in use by wolverine, other predator damage management methods will be used. In the 2014 BO, USFWS predicted that WS-Idaho's actions would not result in take of more than 4 wolverine over a 10 year period and that no more than 2 of the wolverine would be killed. The USFWS determined that the cumulative impact of WS' activities would not result in jeopardy to the wolverine population. However, out of abundance of caution, in light of the April, 2016 decision in *Defenders of Wildlife v. Jewell*, WS-Idaho has re-initiated consultation with the USFWS regarding potential impacts on wolverine. Pending the outcome of that consultation, WS-Idaho will implement the protective measures identified in the 2014 BO. If the conclusions of the revised consultation indicate impacts substantially different from those already addressed in the EA, WS-Idaho will revise the analysis in accordance with CEQ and APHIS NEPA implementation regulations.

62. Does including grizzly bears as a target species in the EA increase probability that lethal methods will be used to address conflicts with grizzly bears?

As long as grizzly bears are federally protected, there will be no change in WS-Idaho and IDFG efforts to resolve conflicts caused by grizzly bears. WS-Idaho intentional lethal take of grizzly bears is not anticipated to change from current levels (1 bear in the last 8 years). Take will continue to be directed by the USFWS and IDFG and conducted in accordance with applicable state and federal management plans and regulations.

If grizzly bears are delisted, WS-Idaho would continue to emphasize use of non-lethal methods when working with resource owners and managers to resolve conflicts with grizzly bears. As grizzly bear populations increase and expand their range, conflicts between grizzly bears and people are also likely to increase as expanding bear populations and increasing human populations come into contact (USFWS 2016a). After delisting, lethal take of grizzly bears by WS would probably be similar to current levels, but WS-Idaho involvement in direct management of grizzly bears could increase to up to 3 bears per year with most work involving capture and relocation of depredating bears. Lethal removal would not exceed one bear per year. Take would continue to be approved on a case by case basis by IDFG to ensure that cumulative impacts on the population do not result in population declines below management objectives set for population recovery and that all actions are consistent with policies and limits established in the USFWS approved state grizzly bear management plan (IDFG 2002*b*). All grizzly bear management actions must also be consistent with applicable plans and regulations established by the USFWS in association with the delisting of grizzly bears such as the 2016 draft Conservation Strategy (USFWS 2016a, USFWS 2016b). Analysis in the EA indicates that this level of take would not adversely impact the grizzly bear population.

63. EA must make the USFWS BO for WS-Idaho activities available for public review. NEPA process is only point where public can comment on ESA Section 7 consultations. Failure to make the BO available for public review is a violation of NEPA requirements to make sufficient information available for informed public comment.

The EA includes a summary of the conclusions of the Section 7 consultation in the Chapter 4 analysis of the impacts of each alternative on T/E species. As with all items used in the analysis, copies of the Section 7 consultation are available to the public upon request. The BO has been subsequently updated although the conclusions regarding impacts on species listed for protection under the ESA has remained fundamentally the same as the conclusions in the 2014 BO. A copy of the 2016 BO has been posted on the regulations.gov docket.

64. M-44s should be strictly prohibited in Threatened or Endangered Species occupied or potentially-occupied habitats including grizzly bear and lynx areas.

The EPA FIFRA use restrictions for M-44s state that the M-44 device may be used in areas occupied by endangered, threatened or experimental populations if use in such areas a) has been addressed by the USFWS in special regulations pursuant to Section 4(d) of the ESA, in requirements imposed through incidental take statements or incidental take permits, or in other applicable agreements with the USFWS, and b) the applicator's use of the M-44 is consistent with any conditions or limitations provided by the USFWS for such use. Use of M-44s and potential impacts on T/E species grizzly bears and Canada lynx was addressed in the 2014 and 2016 Biological Assessment referenced in the EA at Sections 3.2 and 4.2.1.2 of the EA. With the exception of provisions for protection of wolverine, measures for reducing risks to T/E species from M-44s were identical between the two consultations. WS-Idaho complies with label requirements and the requirements established in Section 7 consultations with the USFWS for the protection of federally-listed species from risks associated with M-44s.

The M-44 is generally selective for canids because of the attractants used and their feeding behavior. These differences combined with the fact that WS does not use lures attractive to felids with M-44s (e.g., no anise based lures or feathers) are the reason WS and the USFWS determined the use of M-44s would have no effect on Canada lynx (USDA 2014, 2016; USFWS 2014, 2016). Program-wide, there has been no incidental take of lynx with M-44s. Consultations with the USFWS also established that WS-Idaho would not use M-44 devices between March 1 and November 30 in areas occupied by grizzly bears. Commenters have questioned whether the interval of time when M-44s can be used in grizzly bear habitat should be shortened because changing climate could increase the period in which grizzly bears are active. WS-Idaho has received subsequent confirmation from the USFWS that, based on USFWS observations and data, this interval is sufficient to prevent grizzly bears from accessing M-44s. Provisions for the protection of wolverine in the 2014 BO include that WS-Idaho will conducting intensive and extensive surveys to see if there is any wolverine activity in the area.[26] If there is any wolverine

[26] For the purpose of the WS 2016 BA, extensive surveys will cover the area within a 3 mile radius (28.27 mi^2) of a proposed location where a wildlife damage management method will be used and will consist of driving dirt roads;

activity in the area or WS-Idaho is notified of any activity, WS-Idaho will not use M-44. WS will periodically conduct extensive surveys during the time-period M-44s used in potential wolverine habitat, and if evidence of wolverine presence is verified, WS will immediately remove the M-44s. For these reasons, and the fact that no wolverine has been harmed by the use of M-44s, the likelihood of a wolverine being adversely affected by the use of M-44 is discountable.

65. EA fails to consider value of coyotes to ranchers because they eat animals such as jackrabbits that compete with cattle for food. One coyote eats enough jackrabbits to provide food for 2 cattle per year. Cattle sell for $800-$2,200. This financial impact needs to be considered.

Jackrabbits are an important part of coyote diets, but not the only food item eaten so the calculations above likely overestimate the total impacts of coyote predation in terms of jackrabbits removed per year. Although coyotes are a primary predator for jackrabbits, other predator species in the EA's proposed project area also eat jackrabbits including red fox, mountain lions, bobcats, and various raptors (McAdoo and Young 1980). These predators may increase their take of jackrabbits in response to an increase in abundance resulting from the removal of coyotes, which may balance the impacts of coyote removal. Additionally, as noted in Section 4.2.1.1, because of the nature of coyote population dynamics, areas where coyotes are removed are relatively quickly re-colonized by new individuals (non-territorial individuals from the surrounding area) with reductions resulting from anticipated Idaho PDM activities not expected to last more than in one year. As noted in the Chapter 4 analysis of impacts on target species and ecosystems, the short-term, localized reductions in coyote abundance would not be of sufficient magnitude or duration to result in substantive shifts in prey populations and ecosystem function. Consequently, overall impacts on available forage are expected to be very low. WS-Idaho has received no requests for assistance with jackrabbit damage of any sort at least as far back as fiscal year 2004, which is strong evidence that, even with the current levels of PDM, jackrabbits populations have not been exacerbated as a result of the ongoing PDM activities within Idaho.

66. Are the data used to analyze impacts on target predators (especially coyote, red fox, skunks and badgers) sufficient? Some of the citations for population information are old. WS needs to provide more detailed information on where take occurs to address and analyze impacts of varying intensity of PDM actions on target species.

The analysis in the EA uses the best information available regarding the status, population size, density, and population trends for target wildlife species populations, however, localized population data is not available for most of the species analyzed in the EA. Many of the species are sufficiently common (e.g., coyote, raccoon, red fox, striped skunks) that few natural resource

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inspecting accessible snow machine trails and walking trails, as necessary; using telemetry equipment when applicable; and visiting with landowners and natural resource personnel, as appropriate, to search for any sign of the species of interest. Intensive surveys will consist of thoroughly searching the immediate area (0.25 mi^2) surrounding the proposed location where a wildlife damage management method will be used, to search for sign or other evidence of the species of interest.

management agencies will commit limited resources to obtaining actual population estimates for the species. For these species, the best available information may be in catch-per-unit-effort data in harvest surveys that can be used as an indicator of population trend (e.g., increasing, decreasing, or stable). Where available, this information is included in the analysis of impacts on target species in Section 4.2.1.1. This trend information reflects the cumulative impacts of all factors on population size over time. IDFG monitors big game species (including predators such as mountain lions and black bears) at the scale of management units based on indices of population health (e.g., age distribution, sex ratios). IDFG uses this data and information on known take of big game species and other sensitive predator species to monitor and adjust take allowances (all take including hunter harvest and PDM) to ensure the long-term viability of these species and that agency management objectives are being met. The analysis in the EA is reviewed by IDFG and WS-Idaho coordinates PDM actions involving big game species with the IDFG to ensure that impacts are within parameters set by IDFG to achieve the State's multiple management objectives for the species including a sustainable healthy population and providing for recreational, aesthetic, and existence values.

We have reviewed and where possible, augmented the analysis of impacts on target species in Section 4.2.1.1 in response to issues raised during the EA comment period. The conclusions based on the updated analyses are consistent with those in the draft EA that was provided to the public for comment.

We have also added Appendix D to the EA which provides take of predators by county for the period of FY 2010 through FY 2015 to facilitate understanding of WS-Idaho's actions. WS take in each county is within annual sustainable harvest limits for the predator species as presented in the analysis of statewide impacts on target species presented in Chapter 4 of the EA. For example, WS-Idaho takes more coyotes than any other species. Using average annual coyote take for each county for the 6-year period, county coyote take ranged from 0.00034 to 0.22 coyotes/mi^2 with an average of 0.05 coyotes/mi^2. Using the coyote density estimate from the EA of 0.6 coyotes/mi^2, this equates to removal of 0.06% to 36.7% of the coyote population, with an average removal rate of 8.3%. Even when the higher levels of take by WS-Idaho are combined with estimates of take by other entities (Table 4.3), WS-Idaho's cumulative impact is within annual sustainable harvest limits for the population. Therefore, no impact to coyote populations in Idaho from all levels of mortality, including the incremental contribution of WS occurs.

Based on the analysis in the EA, WS-Idaho has determined that its proposed PDM actions will not have a significant adverse impact on state predator populations. IDFG has reviewed the material in the EA and concurs with WS-Idaho's determination.

67. The EA needs to provide adequate information on what actions may be conducted on public lands particularly wilderness areas and Special Management Areas. It is not sufficient to state that WS-Idaho complies with agency policies, regulations and other requirements for the management and preservation of SMAs and that special needs are discussed in AWPs because AWP meetings are not open to the public.

The impacts of the alternatives on the types of actions which may be conducted in SMAs is addressed for each of the alternatives in Chapter 4 of the analysis. Section 4.2.1.5 provides information on total levels of take which occur on USFS lands and BLM districts where WS-Idaho works. Appendix B provides additional information on where PDM might be conducted if a need for action is identified, and the types of methods which may be used. Section 3.4.2.3 lists SOPs to avoid adverse impacts on SMAs. Appendix E addresses relations among agencies including management of SMAs.

Land management agencies responsible for the preservation and enhancement of SMAs develop policies, regulations and land and resource management plans to preserve and enhance the valued ecological (e.g., habitat, wildlife, geological features) and cultural (e.g., recreation, spiritual, and existence) values of the sites. These policies and plans are developed in accordance with the applicable laws and policies for public involvement (e.g., NEPA) including associated public involvement processes. Discussions which occur in preparing AWPs and other communications with land management agencies implement practices established through public planning processes and do not generate new procedures.

68. WS-Idaho must assess its actions in site-specific EAs.

Preparation of this EA to address PDM statewide in Idaho is appropriate and consistent with lead and cooperating agency mandates and management guidelines, and consistent with the purpose and need as stated in the EA. As noted in Section 1.4, Relationship to Other Environmental Documents, historically, two EAs were prepared which resulted in similar conclusions. Over time, we have determined that considering PDM from a statewide level facilitates review of cumulative impacts of proposed actions, and obtaining input from cooperating agency and public input. The NEPA document is reviewed regularly to determine if proposed site-specific actions are consistent with the findings in the EA. If a determination is made during the review that the selected action would have a significant impact on the quality of the human environment, then an EIS may be prepared in compliance with NEPA. In terms of considering cumulative impacts, WS believes that one EA covering the entire State of Idaho provides a better analysis than multiple EAs covering smaller zones within the State. Section 1.6.6 further explains why the EA adequately addresses site specific issues and effects.

69. The EA needs to provide limits on the PDM that may be conducted under the alternatives. The EA needs to state extent to which each method will be used.

Maximum take limits have been added to the analysis of impacts on target species in the EA. Analysis of maximum take that may occur under the alternatives is consistent with earlier conclusions that the proposed action would not result in significant adverse impacts on target species populations. The extent to which any individual method is used can vary depending upon weather conditions and other factors which impact the feasibility, safety, and efficacy of PDM methods and the need for PDM identified by cooperators. Information on the number of animals taken by method has also been added to the analysis of impacts on target species. Changes in access to different PDM methods and their relative use are addressed in the descriptions of each alternative in Chapter 3.

70. Does the fact that the EA considers lethal PDM likely to be conducted by other entities in its analysis compromise understanding of the true impacts of the alternatives? Is the EA inadequate because it fails to analyze an alternative in which lethal methods would be substantially reduced?

The EA analyzes the consequences of choices available to WS-Idaho and analyzes a full range of WS options including an alternative in which WS uses nonlethal methods exclusively. CEQ (1981) notes that when a choice of "no action" by the agency [in our case – Alternative 2 – No Federal WS-Idaho operations] would result in predictable actions by others, the consequence of the "no action" alternative should be included in the analysis. As noted in Response 36, WS-Idaho believes there is sufficient reason to expect that lethal PDM actions by entities other than WS-Idaho under Alternatives 2 and 4 would be similar to lethal PDM actions by WS-Idaho under Alternatives 1 and 5. Comment letters like those provided by the Idaho Farm Bureau, the Idaho Woolgrowers Association, and Owyhee County Board of Commissioners expressed support for an integrated PDM program including responsible use of lethal PDM methods. We believe the comment letters, recent decisions by the State, and the fact that lethal PDM is already being conducted by entities other than WS-Idaho are strong indications that implementation of lethal PDM would continue even if WS-Idaho does not assist with implementation of lethal PDM.

71. Does the EA fail to acknowledge data presented by commenters that nonlethal methods work and that a nonlethal alternative would result in less killing? Does the EA inappropriately dismiss the success of the Marin County program and its applicability to Idaho?

The EA acknowledges, and has considered, all available data regarding the effectiveness of nonlethal methods. WS-Idaho would encourage use of practical and effective nonlethal methods under Alternatives 1, 3, 4, and 5. This includes recommending methods such as fencing, night penning, livestock guarding animals, herding, carcass disposal and other methods used and recommended in the Marin County program (Fox 2008). Moreover, WS considered and thoroughly analyzed a nonlethal management only alternative (Alternative 3) in the EA. (See Response 27 above). Nothing about WS selection of Alternatives 1, 3, 4, or 5 would preclude cooperators (i.e., counties, predator control boards, etc.) from adopting a program such as the one used in Marin County and receiving WS assistance with implementation of their program.

The Marin County program referenced by the commenter could not be adopted as an alternative because it does not satisfy the purpose and need of the EA. The two primary nonlethal methods supported by the Marin County program are fencing and livestock guarding animals. Fencing is not a viable option for use in open range and livestock guarding animals can, in turn, be prey for some of the predators addressed in this EA (e.g., bears and lions). The Marin County program only addresses livestock depredation issues and does not address the other types of need for action presented in Chapter 1 of the EA such as protection of human health and safety, reduction of damage to property or actions to protect sensitive prey species, nor does it address conflicts with the full range of predators addressed in the EA. Additionally, the range of information needed to adequately assess the Marin County program is not available. Project Coyote (2015) and Fimrite (2012) reported reductions in program costs and livestock losses for producers participating in the Marin County program. While the use of fencing and livestock guarding animals undoubtedly helps to reduce losses for some producers, the Marin County program has changed since its inception. The reports fail to consider other factors which may also lead to decreases in costs, producer reports of livestock losses and producer participation in the program. For example, the program no longer includes compensation for predator losses which may contribute substantially to decreased operations costs, producer willingness to report losses, and willingness to participate over time. No assessment of the changes have been made and therefore, it is unknown whether the changes in the program contribute to cooperator participation rates and acceptance of the program. There is also limited or no data on producers who are not participating in the program. As noted by Larson (2006) and Fox (2008), although it is understood that lethal methods are being used by producers, no concrete data is available documenting the nature and extent of these removals. Larson (2006) estimated that coyote take by non-WS entities in the absence of actions by WS-California was substantially higher than take by WS-California prior to the implementation of the Marin County program. See also Response 27.

72. Does providing lethal PDM for free incentivize producers to not take action to prevent predation or even result in producers allowing animals to be killed in order to have predators killed as indicated in an article presented in comments?

We believe the material cited by Bergstrom et al. (2014) represents an extreme opinion and does not reflect the attitudes or behavior of the industry as a whole. WS does not believe a reasonable producer would work to induce predation on livestock in a situation where no predation is occurring just to trigger lethal PDM. Such activity defies reason, is economically unjustified, and would be a poor business practice. WS-Idaho is not aware of any producers who avoid taking predation action or allow animals to be killed in order to trigger lethal PDM.

The WS-Idaho PDM program is not "free" to livestock producers in the state. Producers contribute to the cost of the program. ID State Animal Damage Control Board (ISADCB) receives funds via brand inspection fees on the sale of cows and calves and a sales fee on wool (See Response 28). During fiscal year 2015 alone, WS-Idaho received over $500,000 from the ISADCB to support PDM activities. See also Responses 11 and 29 above and Section 2.3.18.

73. EA needs to acknowledge Nez Perce Tribes rights in the ceded territories. The SOPs need to mechanisms for government to government consultation and coordination regarding impacts to treaty-reserved resources, traditional cultural properties, or other cultural concerns.

Discussion of Nez Perce tribal rights in ceded territories has been added to Section 1.7.1. SOPs on consultation with tribes have been added to the EA at Section 3.4.2.8.

74. EA needs to give greater consideration to potential economic, cultural and spiritual impacts on Nez Perce tribal members, especially in the ceded territories.

Review of impacts on tribal members has been added to the analysis for each of the alternatives in the EA. WS-Idaho will not conduct any wildlife damage management activities on lands owned by or managed by a federally recognized Native American tribe unless specifically requested by the tribe (Section 1.6.2). WS-Idaho has no current agreements to work on lands owned or managed by a Native American tribe. If a tribe requests WS assistance, WS will consult with it regarding when, where, and how those specific actions will be conducted. At the tribes' request, WS-Idaho will provide reports to the tribe regarding actions conducted on lands within the reservation boundary but not currently owned by or managed for the tribe.

WS-Idaho has initiated consultation with the Nez Perce Tribe. WS-Idaho will maintain ongoing consultation with the Tribe and will provide reports of WS activities in the ceded territories to facilitate ongoing communication and coordination in order to minimize risk of adverse impacts on resources of importance to the Tribe. WS-Idaho will not initiate any new PDM activities for the enhancement of natural resources in the Nez Perce ceded territories without first consulting with the Tribe. Similar provisions can and will be implemented for other federally-recognized tribes at a tribe's request.

We believe that with the ongoing consultation measures and SOPs added to the EA, and the associated ongoing adaptive process of identification and work to minimize or avoid adverse impacts, risks of adverse impacts on tribal members from the proposed action are low.

75. EA needs to acknowledge that WS has trust responsibilities to the tribes that other entities do not, so impacts on tribes will differ among alternatives.

WS agrees that it has trust responsibilities to the tribes that other entities do not. Alternative 2 and, to a lesser extent, Alternatives 3 and 4, shift conducting of PDM activities from WS-Idaho to non-federal entities that do not have the same obligation to consult and coordinate with tribes as federal agencies. Those alternatives could reduce the ability of tribes to participate in PDM decision-making and to address the potential for adverse impacts on treaty-reserved resources, traditional cultural properties, or other cultural concerns. The provisions for ongoing consultation with requesting tribes are a key mechanism by which WS will work to minimize risk of adverse impacts on tribes. WS has modified the EA in Sections1.6.2, 1.7.1 and 3.4.2.5 to clarify its responsibilities and the provisions for minimizing adverse impacts on tribes.

76. EA needs to consider additional data on impact of lead ammunition provided by commenters and consider an alternative that eliminates use of lead ammunition.

Effects from the use of lead ammunition are discussed in Section 2.3.27 of the EA. This section of the EA has been updated to include more recent data on the impacts of lead ammunition. Although this information provides greater clarity on the issue, it does not fundamentally change the cumulative impacts of WS-Idaho lead ammunition use presented in the EA. Use of lead ammunition can and does result in unintentional mortality of non-target animals. Concerns would be greatest for species with relatively low abundance, such as eagles. However, analysis in the EA indicates that the cumulative impacts of mortality associated with consuming lead ammunition are not adversely impacting avian and predator and scavenger populations, as indicated by review of impacts on eagle and vulture populations in the state. WS' use of lead ammunition is a small fraction of total lead ammunition use in the U.S, and the consequences of WS-Idaho's discontinuation of lead ammunition use is not expected to result in measurable population-level impacts on predators and scavengers. Nonetheless, WS-Idaho continues to review the availability and performance of non-lead ammunition options relative to program safety and ammunition performance needs.

77. WS-Idaho needs to consider indirect impacts on non-target species including impacts on trophic cascades, biodiversity, ecosystem services, ecosystem resilience and mesopredator release in greater detail including studies presented by commenters.

WS has considered these impacts in the EA. For easier reference, analysis of these issues has been moved to the Chapter 4 analysis of impacts on non-target species and ecosystems for each of the alternatives and is augmented by studies presented by commenters as applicable. Some studies presented by commenters were considered, but not discussed in the EA. Specifically, studies regarding the impacts of wolves on ecosystem function were not discussed, in part, because they often compared ecosystems with and without wolves. Additionally many of these studies on wolf impacts to ecosystems were conducted the wolf restoration areas where hunting and trapping is not permitted. The fact that ecosystem impacts may have occurred after the introduction of wolves in areas with unharvested coyote populations is further indication that the impacts are specific to wolves. Studies involving wolves were only considered if they involved impacts on other predator species listed in this EA (e.g., Berger et al. 2008, Berger and Conner 2008). Analysis in Chapter 4 indicates that the proposed action will not result in the eradication of any target or non-target species, and that any reductions would be short-term and highly localized. Consequently, studies evaluating systems in which predator species populations are completely eradicated represent scenarios which will not result from any of the alternatives and, therefore, were reviewed and considered, but did not change WS-Idaho's analysis in the EA.

WS also did not change its conclusions regarding program impacts based on studies that provide examples of situations wherein reductions in predator populations resulted in shifts in predator or prey populations and indirect impacts on trophic cascades (relationships among species within ecosystems), species diversity and/or species abundance (EA Section 4.2.1.2). These types of impacts do not occur instantaneously after removal of predators and the studies generally required sustained, substantial reductions in predator populations over a period of several years. In contrast, as discussed in the EA in Section 2.1, impacts of PDM actions proposed in the EA are generally of low magnitude and short duration such that indirect impacts on ecosystems and ecosystem function are unlikely. Any instances where such impacts may occur are likely to be highly localized, and not of sufficient scope, duration, or magnitude as to constitute a significant impact.

78. EA fails to provide sufficient information on when, where, and how PDM projects to reduce impacts on other wildlife populations will be conducted so that the public and agencies can review and understand impacts.

We do not agree. The EA provides ample information on PDM projects to reduce impacts on other wildlife populations. Chapter 1 presents information on the types of PDM for the protection of and enhancement of other species that might be requested of WS-Idaho. It also notes that the only types of PDM of this nature currently conducted by, requested of, or anticipated to be requested of WS-Idaho are projects for the protection of Northern and Southern Idaho ground squirrels and raven management for the protection of sage-grouse. PDM for the protection of natural resources is addressed in the same manner as projects for the reduction of predation on livestock, risks to human health and safety, and damage to property. The need for action can be anticipated, but the actual location and nature of each specific event is not known until a specific request is received (EA Section 1.6.6).

This EA addresses issues identified in EA Sections 2.2 and 2.3 as they relate to specific areas whenever possible. However, for the most part, the issues are the same, regardless of where the proposed action may occur, and are analyzed as such when appropriate. For example, the effects on social values or target species are evaluated wherever PDM actions may occur, potentially anywhere in the state. On the other hand, effects on T/E species can be more location specific (based on certain habitat types) and, therefore, the analysis and proposed measures for reducing any risks are focused on PDM effects where a given T/E species may be found. The standard WS Decision Model (Chapter 3, Section 3.2.1; WS Directives 2.101 and 2.105) is the site-specific procedure for determining methods and strategies to use or recommend for individual actions conducted by WS-Idaho. Decisions made using the model are in accordance with the SOPs described herein and adopted or established as part of the decision. Prior to initiating any project, the potential individual and cumulative impacts of the action are reviewed in context of overall impacts, SOPs and limits on program activities that are set in the EA. WS will not conduct PDM projects that do not fit within the parameters analyzed in the EA; any such project would require additional review pursuant to APHIS and CEQ NEPA implementation requirements.

79. Is statement that some types of stress are beneficial correct and appropriate for inclusion in the EA?

The discussion of the different types of stress that an animal may experience provided in Section 4.2.1.4 provides context to the discussion of the humanness of PDM actions and is based on a description of stress in animals provided by the American Veterinary Medical Association (AVMA 2007) in its guidelines on euthanasia.

80. A 24 hour trap check interval is an ethical baseline which WS must consider and adopt. WS is exempt from the state 72 hour trap check requirement and the 3-4 day "typical" trap check period that WS asserts in the EA is inhumane and unacceptable because animals are exposed to prolonged pain, and environmental extremes. Also, use of term typically, means some animals are left in traps even longer. WS should check traps at least 4 times a day.

WS strives to minimize the interval between trap checks to the maximum extent practicable under current circumstances. Staff limitations, the distance between project areas, and difficulties in accessing sites mean that the number of producers who could receive assistance from WS-Idaho would be substantially reduced if WS were required to adhere to a 24-hour trap check interval. On average, each WS-Idaho field employee is responsible for addressing the wildlife conflicts within nearly a 7,000 square mile area. Conflicts that arise may occur throughout that area, necessitating a lot of travel time to monitor equipment and to meet with cooperators to discuss new conflicts and possible solutions that do not require the placement of traps and snares. When necessary, the employee will place the minimum number of traps and/or snares necessary to resolve the conflict to keep their set equipment inventory minimized at any one time, most often less than 30 sets collectively throughout their area of responsibility.

WS works to reduce trap check intervals in remote areas through coordination with landowners, managers and herders to check traps when a WS employee cannot be present and research into the use of monitoring devices that notify WS employees when a trap has been triggered or an animal has been animal captured. Captured animals are often dispatched by the individual checking the equipment in the same fashion that WS dispatches animals. In doing so, most equipment is monitored and checked daily and very seldom will trap check intervals exceed 3 days. However, data on trap checking by cooperators is not recorded in the MIS database. When delays in excess of 72 hours occur, delay is usually the result of emergencies, such as wildfires and weather (washed out access roads) and other events that may occur with little or no notice which prevent access to the site.

The NWRC has also investigated trap monitors for use in assisting WS employees in monitoring traps (Darrow and Shivik 2008, Gebhardt et al. 2009). These devices may be employed in remote areas when access may be difficult. WS-Idaho generally does not need to go to these lengths to resolve the conflict, so these devices are generally not used in our control actions. A key limitation to use of these devices is the requirement for the receiver to have a direct line-of site to the equipment for it to pick up the signal that indicates that the equipment may have captured an animal. Utility of these devices is also limited by problems with the devices sending false signals. Consequently, to be certain that the transmitting device is functioning properly, including the batteries, the equipment is normally visually checked at regular intervals regardless of signal on the device.

Recommendation to check traps at least 4 times a day is impractical for reasons noted above. Given the amount of human activity and site disturbance associated with trap checks, would also substantially reduce the likelihood that a target animal would approach the area where the trap is set and adversely impact the utility of the method.

81. Does EA misrepresents public concern about humaneness when it addresses the idea of public concerns about "unnecessary pain"?

We understand that some members of the public consider any action which results in any level of pain or distress to an animal is unilaterally unacceptable. However, based on surveys showing that the public has a sliding scale relative to perceptions of the acceptability of PDM methods such as trapping, we do believe that the idea of "unnecessary pain" is relevant. For example, Jonker et al. (2009) documented that public acceptance of lethal methods increased as severity of beaver damage in Massachusetts was perceived to increase. In a survey of Colorado residents by Manfredo et al. (1999) the majority of respondents agreed that trapping was acceptable to prevent disease and to protect livestock, but unacceptable on the basis of providing recreation or making money.

82. Does the EA accurately address risks to non-target species from traps? Data from Proulx and Barrett (1993) indicate that 73% of all captures were non-target species and data from Novak (1987) indicate that conibear traps capture 2 non-target animals for every target animal captured.

The EA does accurately reflect risks to non-target species. WS-Idaho data reports for FY 2011-2014 show ratios of non-target to target species capture ratios far below those cited by commenter (0.08 non-target species captures/target species captured in body-gripping traps and 0.09 non-target species captures/target species captured for foothold traps). The traps in the study by Proulx and Barrett (1993) were set in natural areas to capture mink by fur trappers and not by WS employees trained in targeting specific species to reduce damage. Furthermore, WS-Idaho rarely targets mink. In the situations where mink are targeted, damage is usually to poultry and the traps are set in or near barnyards where the risks of capturing non-target species are substantially different from the wild areas where fur trappers usually set their equipment. Novak (1987) summarized the data on non-target to target captures from the literature. Non-target to target capture rates presented by the commenter were the high end of a range of reported non-target species capture rates. Novak (1987) noted that a number of factors could substantially reduce non-target capture rates including, careful selection of bait, trap type and the use of pan-tension devices, which is standard operating procedure by WS-Idaho. For example, Novak (1987) cited a study by Turkowski et al. (1984) wherein exclusion rates (the percentage of animals that stepped on the device trigger but did not activate the device) for non-target animals were 92%, 100% and 95%, respectively, for traps with shear pin, curved leaf spring and steal tape pan tension devices, while exclusion rates for traps without the pan tension devices was 6%. WS-Idaho personnel are trained and experienced in the use of methods such as pan tension devices, bait selection, selection of capture devices and placement of devices to minimize risks to non-target species.

83. Are PDM actions to enhance game species populations a violation of wilderness policy because they are perturbations by man? As such does this type of PDM cause irreparable harm to the wilderness character of these locations and those who seek to enjoy Idaho Wilderness Areas? Is WS-Idaho's use of motorized vehicles in wilderness areas a violation of the Wilderness Act?

Yes, WS-Idaho's actions are in compliance with the Wilderness Act. WS-Idaho only conducts activities and uses methods in wilderness areas that have been approved by the applicable land management agency in AWPs or project specific consultations. The IDFG maintains authority to manage the wildlife on these lands. If their proposed management actions involve certain actions (e.g., use of mechanized transportation) that are generally prohibited without special review and authorization of the land management agency, it is their responsibility to obtain necessary approvals for these projects. Determinations as to the appropriateness and, if needed, authorizations for wildlife management activities in Wilderness Areas and the tools which may be used are made by the applicable federal land management agency and are outside the scope of WS authority. The "Policies and Guidelines for Fish and Wildlife Management in National Forest and Bureau of Land Management Wilderness" (AFWA et al. 2006) were prepared collaboratively by the Association of Fish and Wildlife Agencies (AFWA), the USFS and BLM and provide guidance to agencies on balancing the responsibility of federal agencies for management of wilderness areas and the responsibility of state agencies for wildlife management including wildlife on USFS and BLM lands. The Guidelines note that the USFS and BLM are required to preserve wilderness character as directed by the Wilderness Act**,** while supporting the States' fish and wildlife objectives, to the extent such objectives are consistent with the Act. And that Section 4(d)(7) of the Wilderness Act provides that "nothing in this Act shall be construed as affecting the jurisdiction or responsibilities of the several States with respect to wildlife and fish in the national forests." Use of motorized vehicles is not completely prohibited by the Wilderness Act. The Act and agency implementing regulations provide guidance regarding the limited and tightly controlled circumstances under which motorized vehicles may be used. The Wilderness Act does not prohibit the use of foothold traps or firearms, which are available to be used by the general public in Wilderness Areas.

EA Section 1.7.2 and 3.3.6 notes that some portions of WAs in Idaho have historic grazing allotments, however, WS-Idaho does not currently conduct PDM in WAs for the protection of livestock and other resources, but if future requests to conduct PDM in WAs, WS-Idaho would consult with the appropriate Federal land agency to ensure activities are in compliance with the Act. WS-Idaho only conducts activities and uses methods in wilderness areas that have been approved by the applicable land management agency in annual work plans or project specific consultations. It is the responsibility of the agency requesting the natural resources protection or enhancement project (usually IDFG) to obtain necessary approvals for these projects.

84. WS reports it killed more than 116,000 animals including thousands of coyotes. Literature submitted indicates that this level of killing has contributed to the localized extinction of many North American species and has fundamentally altered ecosystems.

We do not agree. The number of animals taken reported by commenter is a reference to WS activities reported in program data reports for FY 2014. Of the 116, 891 animals lethally removed, 113,831 (97.4%) were a combination of non-native invasive European starlings, rock pigeons and house sparrows (primarily starlings), all of which are outside the scope of this EA. Non-native species compete with native species for resources and removal of these species is generally considered to have beneficial ecological impacts. Impacts resulting from the removal of the remaining species applicable to this EA indicates the proposed action will not result in significant alterations of target or non-target species populations, ecosystems, biodiversity, trophic cascades or ecosystem stability (See also Response 77).

85. Do WS personnel accurately report take of target and non-target species?

All WS personnel are required to accurately report their field activities and technical assistance work they conduct while on official duty in the MIS including take of target and non-target animals (WS Directive 4.205). WS supervisors are required to review work tasks for accuracy and to monitor: 1) compliance with rules and regulations for the use of pesticides and other special tools and methods and 2) adherence to permits, regulations, laws and policies pertaining to WS actions. The 2015 report on the USDA Office of Inspector General audit of the WS predator damage management program looked at the predator damage management program and transparency, among other issues. The audit concluded that WS was generally in compliance with all applicable laws. Of almost 30,000 entries in the management system, 98% were correct with discrepancies of 2% identified including both under- and over-reporting of take. Wildlife Services is committed to addressing OIG recommendations intended to reduce discrepancies.

86. Does WS take of non-target species undermine state and federal efforts to conserve and recover species which need special protection?

No, WS-Idaho PDM actions do not undermine efforts to recover sensitive species. Analysis in the EA indicates that WS take of non-target species has been limited and that the proposed WS PDM actions will not adversely impact non-target species populations. IDFG was a cooperating agency in preparation of the EA and reviewed EA content, in part, to help ensure that proposed actions would be conducted in such a way that does not conflict with existing management actions. WS-Idaho also consulted with the USFWS regarding impacts on T/E species via the ESA Section 7 consultation process to ensure that the proposed actions would not jeopardize listed species and that the program was taking all reasonable measures to minimize or eliminate risks to T/E from PDM activities.

87. EA needs to discuss WS institutional ethics.

All WS personnel are expected to adhere to the WS code of ethics codified in Directive 1.301. Compliance with the directive has been added to the EA at Section 3.4.2.4. Ethical concerns regarding PDM are also discussed for each alternative in Chapter 4 – Humaneness and Ethical Perspectives.

88. EA needs to address possibility that non-target animals released on-site may not survive, especially given the physiological stress of being held in a trap for several days under WS-Idaho's current trap check standards.

As noted in EA Section 4.2.1.2, death and unintentional capture and release of non-target animals by WS-Idaho is very low relative to the number of target animals captured (See also Response 82). WS-Idaho personnel take careful note of the condition of captured non-target animals including responsiveness, and injuries. If the WS employee determines the animal is not likely to survive, it is euthanized on site. Not all animals released will die later, although the possibility of some capture mortality always exists with any live capture of wildlife. However, given the small number of non-target animals captured and released (7 or less individuals per species per year;

Table 4.21) any mortality which may occur is not of sufficient magnitude to individually or cumulatively adversely impact target species populations.

89. It is not adequate to defer measures to minimize impacts to recreation to work plans because they are not public and do not meet agency's NEPA obligations. Details must be provided in EA.

The need to reduce impacts to recreation and strategies used to minimize risks are developed on a case by case basis using the WS Decision Model and in consultation with cooperating agencies during the work plan process. Strategies are updated annually or more often as needed depending on circumstances. A description of strategies commonly used by WS to minimize impact on recreation has been added to the EA Chapter 4 analysis of impacts on "Cultural Impacts Including Impacts on Native American Cultural Uses, Hunting, Non-Consumptive Uses, and Aesthetic Impacts"

90. Does EA Section 3.4.2.7 inappropriately defer cost:benefit analysis to a future time instead of presenting it in the EA?

No, costs and benefits of the program alternatives are considered in detail for each of the alternatives considered in detail in Chapter 4 of the EA (e.g., Section 4.2.1.7). Section 3.4.2.7 refers to site- and project-specific considerations made using the WS Decision model thought process described in EA Section 3.2.1. When identifying site specific strategies for use by the cooperator, WS employees take into consideration factors such as the cost of implementing the method relative to factors such as the size of the operation, magnitude of the conflict and likelihood that the incident will recur. However, as noted in Section 3.2.1, the cost of management may sometimes be secondary because of overriding environmental, legal, public health and safety, animal welfare or other concerns. See also Responses 28 and 51.

91. EA needs to consider impacts on wildlife populations at a regional scale. Wildlife targeted by WS do not have population boundaries that follow state lines. This is especially true for rare species such as lynx, wolverines, wolves, grizzly bears and other forest carnivores.

Most resident mammal species are managed at the state level, including establishment of harvest limits and regulations pertaining to damage management. Some species, especially those federally-listed as threatened or endangered and migratory birds are managed at the national level. Accordingly, the analysis in the EA considers impacts on grizzly bears in context of USFWS management units. Impacts on migratory birds, specifically ravens and eagles are also considered at the regional scale (EA Section 4.2.1.1). Impacts on non-target species are generally substantially lower than impacts on target species. WS-Idaho has not had any unintentional take of fisher or martin, the only known unintentional take of a Canada lynx was one animal in 1991 which was released unharmed, and there has been no unintentional take of wolverine since protective measures were implemented in 2010. Given the extremely low level of risk to these species additional analysis of impacts at the regional scale is not warranted.

92. Does WS wrongly state that livestock grazing an approved use of wilderness areas?

Section 4(d)(4)(2) of the Wilderness Act states: ***Water resources and grazing. (4)*** *Within wilderness areas in the national forests designated by this Act, …* ***(2)*** *the grazing of livestock, where established prior to September 3, 1964, shall be permitted to continue subject to such reasonable regulations as are deemed necessary by the Secretary of Agriculture.*

93. Do WS current activities in WSAs fail to conform to BLM Interim Management Policy for Lands Under Wilderness Review that state that animal damage control activities may only be directed at a single offending animal, may not diminish wilderness values of the WSA and will not jeopardize continued presence of animal species and that shooting of firearms from aircraft is only allowed where authorized?

Commenter makes multiple errors in their statements regarding the contents of BLM Manual 6330. The Manual fully states: "Predator control activities must be directed at the specific offending animal **or group of animals**." The conditions of control are not solely limited to the "specific offending animal" as alleged by WWG. The Manual does not restrict where animals may be taken with the use of aircraft. The closest resemblance of restriction may be found in subparagraph iv, which states, "*Acceptable control measures include lethal and nonlethal methods. Criteria for choosing a particular method include need, location, environmental conditions, the preservation of wilderness characteristics, and applicable Federal and State laws. Use only the minimum amount of control necessary to solve the problem*." Although the current BLM guidance on management in wilderness study areas (BLM 2012) does not speak to the use of specific PDM methods, but earlier guidance (BLM 2003) specifically addresses use of aircraft and provides insight in understanding activities which may be conducted in WSAs. Specifically, the guidance notes that, "Shooting of animals from aircraft can occur in WSA's in any State where the activity is consistent with State law and has been previously coordinated with the BLM State Director". WS follows these broad criteria through the normal course of wildlife damage management actions, regardless of whether they are on BLM land or any other lands.

As indicated in the analysis of impacts on target and non-target species, WS-Idaho activities would not jeopardize the continued existence of any wildlife species anywhere where WS works. Impacts of WS-Idaho's PDM actions are short-term and limited in scope and do not result in permanent alteration of landscapes or ecosystems which would compromise the wilderness character of these areas. WS activities which are not suitable for lands designated as wilderness can be discontinued immediately if and when these areas are designated as wilderness and, as such, do not compromise the suitability of these areas for future listing as wilderness.

94. Commenter has evidence that WS-Idaho conducted PDM in Burnt Creek WSA. Why is Burnt Creek not discussed in the EA with the other WSAs?

The incident in question involved wolf damage management which is outside the scope of this EA.

95. Why is the number of migratory bird that may be taken by WS sometimes higher than the number on USFWS permits issued to WS?

WS may take migratory birds under depredation, scientific collecting permits or other permits issued directly to the program. WS may also take migratory birds as the officially designated agent of another entity with a scientific collecting permit if so designated on the permit. The maximum number of birds which may be taken that is considered in the EA is a projection of anticipated future need and may exceed the number of birds currently on permits. WS-Idaho would never take more birds than allowed under current permits.

96. WS should consider whether carcasses left from PDM actions are contributing to sage-grouse problems by attracting scavengers (ravens).

The primary predator on sage-grouse nests (ravens) has had a period of sustained population increase starting in the that is attributed to increases in development, anthropogenic food resources (e.g., trash, roadkill) and habitat changes (e.g., power transmission lines). WS take of predators equates to roughly one animal per mi^2 and is not of sufficient density to attract predators to areas where sage grouse are nesting.

97. All control actions and verification of predation events should be videotaped and archived and made available to the public.

Response: Trying to videotape all predation and control activities is not feasible and would create an undue burden and expense on all parties involved.

98. Would repeated removal of predators from specific areas reduce genetic diversity?

Comment appears to be made in context of removal of coyotes, which is the type of PDM conducted by WS most likely to result in repeated removals of animals in consecutive years (Taylor 2009, Bergstrom et al. 2014). Impacts of repeated localized removals of coyotes as conducted by WS-Idaho on coyote numbers has been addressed in Section 4.2.1.1. Coyotes are common throughout the state and barriers to coyote movement and associated genetic exchange have not been identified for this species in the state. As noted in Section 4.2.1.1, local coyote populations which are subject to removals are expected to recover in less than a year through reproduction of remaining animals and immigration of non-territorial individuals from the surrounding area. Immigration of coyotes from surrounding areas also serves to maintain genetic diversity in the populations. Therefore, we conclude that the proposed action will not lead to reduced genetic diversity in the coyote population. See also Section 4.2.5.1 relative to impacts on ravens.

99. Coates and Delehanty (2004) should not be used to justify raven removal to enhance sage grouse populations because it compared nest success at the project site to an average for the region instead of something more site specific.

The comparison of site specific conditions to general regional trends in a population is an acceptable practice so long as potential sources of variance between the project site and the wider area are acknowledged which was the case for Coates and Delehanty (2004). Additionally, Coates and Delehanty (2004) is only one of several sources of information noted in EA Section 1.2.3 to document the potential impact of ravens on sage-grouse populations and is not the sole source used to determine that raven predation may be adversely affecting sage-grouse nesting success.

100. EA needs to consider ecological consequences of boosting prey species by PDM to enhance game species.

Determinations of the need for PDM to enhance game species populations are made by IDFG after consideration of habitat quality, historic data for the population and other biological factors (IDFG 2011*d*,*e*; 2014*c*,*d*). When IDFG sets population management objectives, objectives are set to be within historic norms and carrying capacity of the local environment. Therefore, efforts to assist IDFG in restoring game species populations to target levels would, in essence, be restoring the environmental status quo and would not have significant environmental impacts. At present, WS-Idaho has no current requests to conduct PDM involving the target predator species listed in this EA to enhance game species populations.

101. Does the EA need to consider baseline levels of disturbance present in each WSA when it was designated and on all the relevant resources it was designated to protect?

No, site-specific consideration of these factors is not necessary. WS-Idaho has been conducting PDM activities in the state for decades. The description of impacts under the current/baseline program is the review of the baseline environmental conditions. Assessment of a scenario without PDM would not be the environmental baseline, it would be a substantive change from baseline conditions. WS actions in WSAs are most likely to be conducted for the protection of livestock. If livestock are present in WSAs it is generally because the use of the area for grazing precedes listing as a WSA and grazing was one of the known impacts at the time the WSA was established. All actions conducted in WSAs are coordinated with the applicable land management agency through AWPs or site/project specific discussions, at which time the proposed action is reviewed by the land management agency for consistency with applicable land use policies and conditions.

102. Why are you proposing to increase take of crows and magpies under Alternative 5? Neither of these species have been identified as having a substantial impact on sage-grouse.

Thank you for your comment. After review of the analysis, increase in anticipated take of crows and black-billed magpies has been omitted from the list of impacts anticipated for Alternative 5.

103. WS needs to improve warning signs for traps, snares and other devices. Signs need to be larger, more durable, posted at all entrances to project area and posted adjacent to the device. Current signs are hard to see under low light, get water-stained and flop over.

Comment appears to be related to older version of signs used by WS. WS currently uses 81/2 x 11 inch signs on heavy treated paper for the warning signs that are placed at entrances to areas where WS sets PDM devices to reduce issues noted above. Given the open access to many of the areas where WS works, posting all possible entrances is impractical. WS Directive 2.450 requires that signs be posted at the main and commonly used access points to project areas. Signs for animal capture devices are placed at entrances to private and public lands. Signs for M-44s are posted at the primary entrances to private and public lands and an additional smaller sign is posted within 25 feet of the device (Section 3.4.2.6). WS does not currently post signs at each individual trap set because signs can affect the willingness of some predators to approach a set. Additionally, there are also instances of members of the public removing or tampering with WS equipment for PDM and placing signs near the devices also facilitates tampering. The current system of posting signs represents a balance between the need to notify the public and the need for the program to be able to effectively use these devices.

104. EA needs to address impacts on raptors from WS use of toxicants. Raptor rehabilitators need to know what toxicants are being used in their area. Raptors that die on public land may be poisoned by birds that have consumed poison on private land.

Comments appear to be made in context to use of DRC-1339. As presented in EA Section 4.2.1.2, risks or secondary poisoning to raptors from DRC-1339 are extremely low and would not contribute to cumulative impacts on raptors that might result from other factors.

105. Does the EA adequately consider long-term range contractions of many wildlife species presented by Laliberte and Ripple (2004)?

Laliberte and Ripple (2004) compared estimated species range based on field sightings recorded in the 18th and 19th century to more recent maps of species range. The list of species considered included all of the native target mammals listed in the EA plus four of the non-target species listed as being of concern in comments on the EA (Canada lynx, fisher, marten, wolverine). Some of the target species listed in the EA were listed as having net range contractions of less than 20% which was identified as being within the margin of error for the mapping systems used (mink and bobcat). Other species were recorded as having net increases in range which were also within the 20% margin of error of the study (long-tailed weasels, striped skunks, spotted skunks, gray foxes, red foxes, badgers, and raccoons). For these species, the study did not provide conclusive evidence of substantive changes in species range over historic conditions and subsequent analysis is not warranted. Coyotes were estimated to have a 40% increase in range. Target species with more substantial estimated range contractions included grizzly bear (53%), black bear (39%), and mountain lion (36%). The study did provide an assessment of human impact, but the factors considered involved human population density, land transformation, accessibility by roads and rivers and electrical power infrastructure. Except for indirect assessment through accessibility, the study did not assess historic factors such as harvest levels which are also known to have a substantive impact on wildlife populations. The study provided a nationwide scale of analysis, and measures of range expansion or contraction were impacted by losses and gains in areas well outside the project area and scope of impact (e.g., the eastern and central U.S.). Black bear range contractions were listed for the southern half of Idaho. Habitat in much of southern Idaho is arid and comparatively poor habitat for black bears and IDFG has closed black bear hunting throughout most of this part of the State. All of these species persist in Idaho and all target native mammal species with the exception of grizzly bears, are sufficiently abundant that the State allows harvest or take without permits (e.g., weasels are not harvested in Idaho but the State allows take for the protection of property). WS-Idaho take of black bears for damage management only occurs in those portions of the State where bears are relatively abundant and hunting is permitted. Cumulative impacts to fisher, marten, wolverine and Canada lynx were addressed in detail in Section 4.2.1.2 and were determined to be extremely low and not of sufficient magnitude to substantively impact extant populations. Current status of grizzly bears (under ESA protection as a threatened species) is addressed in Section 4.2.1.1. Criterion for listing species under the ESA and subsequent delisting determinations include consideration of the species current and historic range. Through consultation and coordination with the USFWS and compliance with regulations pertaining to the listing and subsequent management of grizzly bears, WS-Idaho ensures that program activities do not jeopardize recovery goals (population size and range) for the species. Based on the limitations to the study and other information provided above, no additional review of species range in context of Laliberte and Ripple (2004) is warranted.

106. Data from Hurley et al. (2011) indicate coyote removal does not benefit deer populations and other data presented indicate the same thing so coyote removals for deer population enhancement are not warranted.

Agreed. Based on information presented in Section 1.2.3 and discussions with IDFG, WS-Idaho does not anticipate receiving requests to conduct coyote removals for deer population enhancement.

107. How will WS comply with requirement to collect unconsumed bait cubes daily or observe continuously baited areas from a distance of no more than 100 yards. EA states that WS is not complying with this requirement because it says "at the conclusion of the treatment period" the WS specialist collects unconsumed eggs and disposes of them which is a treatment period of more than one day.

Commenter has misinterpreted label directions and confused application protocols. WS-Idaho complies with all label requirements. The EPA label instructions for the use of egg baits to protect natural resources do not require observation distance of no more than 100 yards. It does require that pre-treatment applications be monitored for non-target species and optimal placement for target species. Specifically, the label reads:

PRETREATMENT OBSERVATIONS:
Prior to application, carefully observe target birds' feeding habits to locate their preferred feeding sites, determine the optimum time of application, and evaluate potential hazards of the application to non-target and protected species.
PREBAITING:
Pre-baiting with untreated bait materials (or use of a draw station) is necessary to promote feeding by target species and to assess potential for exposure of non-target species. Apply pre-bait using the same procedures that are prescribed below for the type of bait ("EGG BAITS" or "MEAT BAITS") that is to be used for toxic baiting.

Observe baited areas (from blinds) early in pre-baiting period to determine whether non-target species are approaching baits. Haze away Threatened or Endangered and non-target species that might consume baits. Remove baits if such non-target species continue to approach them.

The comments regarding the observation of treated baits and collection of unconsumed bait are relative to the use of meat baits which WS-Idaho only uses for raven control at feedlots. The label states:
For meat bait applications (emphasis added):

WHILE TREATED MEAT BAITS ARE EXPOSED, BAITED AREAS MUST BE OBSERVED CONTINUOUSLY FROM A DISTANCE OF NO MORE THAN **1,000 YARDS (914 m)** TO DETECT APPROACHES BY THREATENED OR ENDANGERED SPECIES AND OTHER NONTARGET OR PROTECTED ANIMALS LIKELY TO EAT BAITS. Because of wariness of target bird species, it may be necessary to observe baits from behind natural or specially-constructed blinds. Haze away Threatened or Endangered and non-target species that might consume baits. Remove baits if such non-target species continue to approach them.

Unconsumed bait cubes must be retrieved daily, at the conclusion of each observation period and no later than one hour after sunset. Dispose of retrieved baits in accordance with applicable State and Federal laws.

For egg bait applications (emphasis added):

Observe baited areas (from blinds) early in baiting period to determine whether non-target species are approaching egg baits. Haze away Threatened or Endangered and non-target species that might consume baits. Remove baits if such non-target species continue to approach them.

Rebait with additional treated eggs when more than 50% of the treated eggs offered have been removed by ravens, magpies, or crows. When replacing baits, take care not to frighten target birds actively removing or feeding upon eggs. Retrieve unconsumed treated eggs within 7 days of exposure. Old treated eggs and treated eggs not eaten by the time control operations cease must be disposed of in accordance with applicable State and Federal laws.

To summarize the differences, meat baits require observation when the product is applied and at a distance of no more than 1,000 yards (914 m) while egg baits are monitored during the prebaiting period and has no maximum observation distance established because there is no active ingredients placed during prebaiting efforts. If non-target birds are observed at the prebait site using eggs, the site is abandoned and tried elsewhere. When the egg baits are placed, observations are made with no maximum distance established to haze away non-target animals, including T/E species.

108. Is it true that public land managers provide little to no oversight of WS-Idaho activities or review of potential adverse environmental impacts that could result from WS-Idaho's actions?

No, WS-Idaho complies with all land management agency requirements for the protection of soils, water, vegetation, wildlife, cultural sites and recreational activities. Areas of concern where special management actions are needed or where there are concerns about ongoing activities are identified and addressed in AWP meetings and in ongoing communications between staff of the land management agencies and WS personnel. USFS is a cooperating agency in the preparation of this EA and had opportunities to provide comments during it development.

109. Will carcasses left from PDM result in increases in raven populations and increase problems for sage-grouse.

No, WS-Idaho's lethal removal of predators is not contributing substantively to overall populations of ravens. Coyotes are the species most commonly taken by WS for PDM. A review of coyote take by county (Appendix D) indicates that the density of coyotes killed averaged 1 coyote per 25 square miles over the course of an entire year (range no coyotes taken per county to 1 coyote per 6 square miles over the course of an entire year). Raven populations have been increasing substantially throughout the USGS Western and Central BBS regions. (Sauer et al. 2014). The magnitude of increase over a large range requires a sustained increase in raven subsidies. WS-Idaho's low level of carcass generation is not of sufficient scale or scope to provide year-round support for the current increase in the raven population. Although the proposed use of DRC-1339 could result in an increase in dead ravens, based on the baiting protocol described for Alternative 1, take would be dispersed over a large area and raven populations in project areas are anticipated to decrease. Dinkins et al. (2016) noted that use of DRC-1339 to reduce predation on livestock as would occur under alternatives 1 and 5 did resulted in a decrease in ravens near the project area and helped to increase sage-grouse nest success. In contrast, trash, road kills, and development features such are power lines and other structures that provide perching and nesting areas for ravens are ongoing throughout the year and are the primary factors supporting increased raven populations.

110. If WS does not tier to the PEIS does that mean controls on the use of methods established in the PEIS do not apply?

This EA does not tier to the PEIS. Procedures for the safe and effective use of PDM methods noted in the PEIS are independently analyzed in this EA, including required restrictions or conditions, in EPA labels for pesticide use, WS Directives, and SOPs.. In some cases, procedures for the safe and effective use of PDM methods in this EA are more restrictive than those in the PEIS. For example, based on the materials presented in the EA and a review of M-44 use patterns in the state, WS-Idaho has determined that it will not use M-44s on public lands, even though such use was allowed under the PEIS.

111. Does the fact that WS-Idaho is using lethal PDM including pesticides increase the risks that others will take illegal action against predators or support anti-predator attitudes that call for widespread removal of predators for all situations?

No, it is our experience that when professional effective PDM assistance is readily available, individuals will request that service instead of taking PDM actions on their own. WS understands that predators play an essential role in healthy ecosystems and works with agencies and tribes to ensure that PDM actions will not jeopardize native predator populations or their role in the ecosystem. WS gives preference to nonlethal methods where practical and effective and the WS-NWRC works to develop new nonlethal methods and improve existing methods. WS-Idaho has and will continue to sponsor workshops on nonlethal PDM methods for livestock producers. Adoption of nonlethal methods by livestock producers nationwide is increasing and use of nonlethal methods by livestock producers in Idaho (67%) is higher than the national average (58%). While it may be possible to find individual producers who seek WS services instead of implementing additional nonlethal methods on their own, these instances are uncommon and do not reflect the attitudes of the industry as a whole.

Statement by commenter appears to be based in part on a quote from (Shivik et al. 2003) indicating that as long as producers can externalize costs of predator losses via government-subsidized predator control, they will have little incentive for responsible husbandry and adopting nonlethal management strategies. While we do believe that cultural transition from traditional familiar and effective management strategies including lethal methods can be a slow process, based on the statistics above, adoption of nonlethal methods is increasing. We do not agree with the premise that there is little incentive for producers to adopt sound management practices. Livestock producers strive to reduce loss of livestock to all causes, and will adopt effective nonlethal methods and sound husbandry practices where practical and effective and most of the cooperators who request WS assistance are already adopting methods noted by Shivik et al. (2003). As part of this EA, WS-Idaho will be collecting comprehensive data on producer use of nonlethal methods to facilitate better understanding of this issue.

Comment may also be based on findings of a recent study by Chaprone and Treves (2015). Blood does not buy goodwill: allowing culling increases poaching of a large carnivore which identified a positive correlation between periods when lethal PDM for wolves was allowed and poaching. Review of the publication by NWRC identified some problems with the study which call the conclusions into question. The paper was submitted to NWRC for consideration. Notes from NWRC are presented below. There is no information drawing a direct link between livestock producers and the total proportion of deer and bear hunters in northern Wisconsin and which individuals actually are poaching. Most poaching in Wisconsin appears to occur during the deer and bear hunting seasons. WI-WS WDM actions may have little impact on the perceptions of hunters, especially in WI where neither the state nor WS conducts WDM for the enhancement of game species populations. The emphasis in the EA is on the fact that access to a prompt effective professional WDM program will reduce likelihood that producers will resort to inappropriate, ineffective or illegal solutions for their wolf conflicts that could have more impacts that a program by WS. Given limitations discussed above regarding the limitations of the analysis, this paper raises no new substantive issues warranting revision of the EA at this time. First, although the model used in the study was sound, there is some question as to whether the difference was biologically meaningful. The increase in population size (as predicted by the model) is fairly stable regardless of the variation in time of policy implementation. Which suggests that this potential human dimensions effect may be extremely weak and perhaps negligible. Also, the time frame during which there is fluctuation in the time that the policy is implemented is fairly short (really only 3 events with close to full year policy in effect). Due to this and the fact that we are dealing with small populations it is entirely possible that there is some environmental process that correlated with these times which led to slower growth rates. While the authors tried to rule out this possibility with a negative density dependence analysis, this was only one way of addressing a complex issue. The assumption they make that the impacts are the result of poaching and that poaching increases because of lethal PDM and not some other cause is not fully supported. In Wisconsin, the majority of poaching is believed to occur during the hunting season. Reasons for poaching by hunters are not well understood, but may not have any relationship to the perceptions of livestock producers regarding access to lethal PDM methods. Alternatively, the increase in poaching may reflect revised individual risk assessments relative to the legal consequences of being caught poaching.

112. WS must place remote motion-activated cameras at all of its animal capture sites and make the subsequent record available to the public and/or provide cameras on each of its specialists similar to those on police officers.

WS does not believe the cost, logistical problems and administrative burden associated with this suggestion is warranted. Concerns regarding the humaneness and impacts of specific PDM methods are best addressed by careful research such as the studies to support trapping BMPs established by AFWA and publications such as Way (2002), Shivik et al. (2005) and Muñoz-Igualada et al. (2008). This suggestion also appears to be based on the premise that WS personnel routinely violate regulations, however, a 2015 Office of Inspector General report on their review of WS program operations found no problems with wildlife damage management activities or with WS' system for tracking controlled materials, and that WS' actions in these areas complied with all applicable federal and state laws and regulations (OIG 2015).

113. EA needs to address potential damage to roads, risk of erosion from roads and introduction of invasive weed seeds that could result from WS vehicle access to project sites?

WS only access wilderness areas by foot or on horseback, so potential for damage to these areas is extremely low. The majority of WS use of vehicles is on the same roads used by the public. WS ground vehicle access to more remote areas is likely similar to or less frequent that visits by staff from the land management agency. Livestock producers access the sites where WS works to address livestock predation more frequently than WS personnel as they visit to check animal welfare and provide supplies to herders and/or range riders. Consequently, WS is only a small portion of total activity on roads and trails on public lands. Issues of vehicle access, road condition, and potential for erosion and introduction of invasive plants are a concern for land management agencies. These agencies assess impacts of road and trail use and develop appropriate policies and rules land in resource management plans and associated NEPA processes. WS personnel will comply with all procedures implemented for the protection of roads and trails and prevention of invasive weed spread implemented by land management agency personnel including use of weed-free feed for horses and mules used during PDM activities.

114. EA needs to address risks of bioaccumulation from WS use of toxicants.

Risks that toxicants used by WS-Idaho may bioaccumulate is low. DRC-1339 is rapidly metablolized and excreted by birds and other species and is not accumulated in plant or animal tissues (Schafer 1991a). DRC-1339 is not persistent in soils because it degrades rapidly in anaerobic and aerobic soils. DRC-1339 is highly volatile and susceptible to degradation by ultralight radiation and heat (Schafer 1990b). Photodegredation of DRC-1339 occurs in water with a half life of 6.5 to 41 hours (USDA 2001b).

USEPA waived the environmental fate studies and data requirements for carbon, sodium nitrate, and the byproducts of the gas cartridges (EPA 1991, 2006, 2008). The basis for the waivers is on the ecological effects of the chemicals and the chemicals are widespread or natural occurring in the environment (EPA 1991, 2008). The burning of these products results in simple organic and inorganic compounds, mostly in the form of gases, which diffuse through burrow openings or into the soil. Exposure of the environment is limited and localized, however, and environmental fate studies are not required (EPA 1991).

Chemical asphyxiation limits the assimilation of sodium cyanide in the body and tissue for predators. The compound is also rapidly metabolized and excreted quickly in animals (HSDB 1991). In general, compounds with cyanide are toxic only upon liberation of the hydrogen cyanide gas which occurs only with primary ingestion (USFWS 1973). Sodium cyanide reacts with acids and decomposes when exposed to moisture when it forms hydrogen cyanide gas. Persistence in the environment is not a concern because of rapid degradation releasing atmospheric hydrogen cyanide to the atmosphere (Schafer 1990a). Atmospheric hydrogen cyanide breaks down to carbon dioxide and ammonia. In other media, cyanide is readily broken down by microorganisms (USFWS 1975a).

Use patterns of 1080 (rare and to be discontinued in Idaho in CY 2017) and strict disposal requirements of the EPA label preclude risks of substantive accumulation in the environment.

ISSUES PERTAINING TO NEED FOR AN EIS INSTEAD OF AN EA TO EVALUATE PDM IN IDAHO

Several comments were received in reference to the need for an EIS instead of an EA to address PDM actions by WS-Idaho. The responses below address these comments. In addition to the responses below, some information is also incorporated into the Finding of No Significant Impact in the Decision document for this EA.

115. Is an EIS needed because WS-Idaho' actions would result in a widespread reduction of predator populations that may have significant impacts on Idaho's environment including impacts to predators, vegetation and habitat for other species, carrion availability for vertebrate and invertebrate species and nutrient deposition which require additional analyses?

We do not agree that an EIS is needed. WS-Idaho's proposed action will not result in widespread reductions in predator populations. Data presented in Section 2.1 and the Chapter 4 analyses of impacts on target predator populations, non-target species and ecosystems for each of the alternatives indicate that WS actions only involve a small portion of the land within the state and that impacts of WS-Idaho predator removals is within the sustainable harvest threshold for target species. Population reductions, particularly of coyotes, which are subject to the most intensive removal, will be localized and would only persist for a year or less before immigration, compensatory mortality and births among remaining animals restore populations to pre-removal levels (EA Section 4.2.1.1).

116. If WS-Idaho PDM actions were to have a beneficial impact on prey populations wouldn't that be a significant impact warranting an EIS?

For the purposes of NEPA, benefits to prey populations from PDM actions specifically conducted to enhance prey populations are a program objective and not an environmental impact per se. Nonetheless, as noted in the EA Section 1.2.3, PDM actions for the enhancement of prey populations are uncommon and limited in terms of the scope of the area to be affected (i.e., they usually only involve protection of a small subset of a prey population). WS-Idaho actions would only be a short-term, localized, supplemental component of other efforts intended to address the primary factors, which may have impacted the target species such has historic overharvest, habitat loss and fragmentation, etc. Thus even though WS actions for a species such as the Northern Idaho ground squirrel with a very limited range may affect a substantial portion of the population, the overall impact on the population is low because predation is not the primary factor impacting the population (the primary factors affecting the population are habitat loss and fragmentation due to forest encroachment, USFWS 2003). Therefore, WS-Idaho does not believe that selection of the preferred alternative will result in a significant impact, beneficial or negative, on prey populations.

117. The fact that the Marin County model could apply to at least some parts of Idaho is further justification for need for area-specific analysis of PDM activities in an EIS.

We do not agree. Any region in Idaho could choose to implement a program like that used in Marin County with assistance from WS-Idaho under Alternatives 1, 3, 4 and 5. The fact that Alternatives 1, 4 and 5 allow WS to include lethal methods when developing site-specific management strategies does not mean that all entities requesting PDM assistance must use lethal PDM methods. Within these alternatives, cooperators (agencies, counties, individuals) may choose to only use nonlethal methods. Cumulative impacts of these choices would be intermediate to those analyzed for Alternative 3 and do not warrant analysis in an EIS.

118. WS-Idaho must not tier to the 1994 Programmatic EIS. The Programmatic EIS is outdated and fails to consider all program activities.

The EA does not tier to the 1994 Programmatic EIS.

119. An EIS is needed to address the profound impacts of livestock grazing because WS PDM activities are connected actions essential for livestock grazing on public lands.

We do not agree. Determinations to allow livestock grazing on public lands and the manner in which livestock grazing is managed on public lands have been made by Congress and State legislatures, and the applicable State and federal land management agencies, and not WS. WS lacks jurisdiction to allow or to prohibit livestock grazing on public lands. Because it has no ability to control that livestock grazing, NEPA's rule of reason does not require WS to analyze the impacts of livestock grazing as a connected action. Environmental impacts of livestock grazing on federal lands is already addressed by the applicable land management agency and is not relevant to this EA, as grazing on public lands is under the jurisdiction and authority of the relevant land management agency.

120. Only an EIS can provide a comprehensive consideration of interrelated land management practices as practiced by existing public, private, state, and other jurisdictions and individuals as needed for this project.

WS does not agree. Information on the relationships among agency authorities has been provided in Appendix E. Relationships among agencies do not constitute an environmental impact warranting preparation of an EIS.

121. An EIS is needed to provide details on the types of actions which may be conducted on different federal land classes.

WS does not agree. EA Sections 4.2.1. and Appendix B provides information for land classes warranting areas of special concern by the commenter. Federal consulting agencies including BLM and USFS were provided copies of the EA for comment to help identify potential areas of concern as identified in applicable land management plans and policies. Nothing in Appendix C, analysis of impacts in the Chapter 4 of the EA including review of impacts on special management areas (e.g., Section 4.2.13), or in the result of interagency review of the EA, indicates that WS activities on those land classes will result in significant environmental impacts.

Also as noted in the EA (Section 3.2.1), WS-Idaho periodically reviews its activities with land management agencies and conducts case by case analyses for areas of concern. These provisions ensure that PDM actions remain within the parameters analyzed in the EA.

122. Is an EIS needed to comprehensively cover all WS-Idaho operational activities instead of separate analysis for different types of wildlife damage management conducted by WS-Idaho?

No. Once completed, this EA is one of 4 analyses addressing the environmental impacts of WS-Idaho's activities in the state. The remaining EAs address bird damage management, rodent damage management and gray wolf damage management. These program components are sufficiently different in the nature of the damage to be addressed, methods used, and/or the nature and ecological role of the species involved that separate analyses are warranted (See also EA Section 1.1). Each EA considers cumulative impacts on target and non-target species populations including potential impacts from other WS-Idaho operational activities. Indeed, combining all of these methods together would consume a large amount of time, money, and resources. WS could implement any one of those four EAs without committing itself to any activities in any of the other EAs; therefore, it is not breaking apart a single action into smaller components to reduce its burdens under NEPA. In this way, we believe we meet the NEPA requirements for assessment of direct, indirect, and cumulative impacts of program activities while also breaking issues down into smaller subject areas that facilitate public, agency and tribal review, as well as understanding of the topic and participation in the NEPA process.

123. Not all carcasses of birds taken with DRC-1339 are located. Does this constitute significant uncertainty warranting the preparation of an EIS?

No, there is not significant uncertainty as to the impact of WS-Idaho's use of egg baits on ravens. WS take of target birds with DRC-1339 is estimated based on an estimate of 1 bird per 2 egg baits consumed/taken from Spencer (2002). Studies discussed in the EA Section 4.1.1 (Stahl 2008) which used computer modeling to show the impact of caching eggs on total number of ravens taken and Coates et al. (2007) which used videography to assess take of eggs by ravens both indicate that the 1:2 ratio over-estimates the number of ravens taken because some eggs may be taken or broken by non-target species or cached by ravens. Consequently, likely impacts on raven populations were reasonably bounded using available data to assess likely maximum potential impact on raven populations and does not constitute significant uncertainty regarding impacts.

124. Is an EIS needed to address any destabilizing effects of hunting and development on mountain lion populations as presented in Peebles et al. (2013), Lambert et al. (2006) and Smith et al. (2015)?

No, an EIS is not needed to address these factors. Response 58 addresses the content of the three articles and their relevance to analysis in the EA. Factors such as hunting and development are ongoing and not a novel situation and impacts of these factors are reflected in overall mountain lion population trends and status discussed in Section 4.2.1.1. Existing IDFG population monitoring and adaptive management of take, primarily hunting, is sufficient to ensure that cumulative impacts on mountain lion populations do not have a significant adverse impact on the state mountain lion population. WS-Idaho take is very low (less than 4 mountain lions per year) and only a small fraction of total known mountain lion mortality and are unlikely to contribute substantively to existing population trends. Management of factors such as hunting and development are outside the scope of WS authority and the scope of this analysis.

125. Now that WS does not use the programmatic EIS, does that mean that product registrations are invalid? Does the lack of an EIS violate the terms of the MOUs between WS and BLM or USFS. Is an EIS needed to address pesticide use on public lands? How does WS decision to prepare an EA for this action relate to other agency's preparation of EISs for pesticide use?

This EA, applicable EPA product registrations, and applicable MOUs, are all completely independent of the PEIS. EPA product registration and WS' analysis of the operational use of a pesticide are independent processes. The MOUs delineate how WS and USFS or BLM will work together on issues, including complying with NEPA, and state that WS will prepare NEPA analyses for some types of PDM actions on USFS and BLM lands. The MOUs do not specify that a particular type of analysis (EA vs EIS) be prepared. NEPA implementing regulations and policies vary among agencies. In WS, the determination to prepare an EIS or EA is made in accordance with 7 C.F.R. 372.5. In the case of the proposed PDM activities in Idaho, the EA provides sufficient information to address potential local impacts (See Section 1.6.6 and Response 68 above). WS-Idaho's determination regarding whether or not the actions proposed in this EA may have significant impacts warranting an EIS is provided in the Decision for this EA.

5.2 ISSUES ALREADY ADDRESSED IN EA

- **There is no need for PDM.** Data on the need for PDM is presented in EA Section 1.2. See also responses to Issues Regarding Need for Action and WS Authorities.
- **There would be no problem if livestock producers were willing to co-exist with wildlife.** See EA Section 2.3.1 – Livestock losses should be a cost of doing business.
- **Proposed action is a ruse to use taxpayer dollars on projects with no objective.** The purpose of the proposed action is to reduce damage by and conflicts with specific predators in Idaho. The need for action is clearly articulated in EA Section 1.2.
- **EA fails to address issue of appropriateness of using rancher-supplied data to quantify losses.** Issue is addressed in Section 2.3.22
- **It has been proven repeatedly that predation is not the major cause, but only a small contributing factor, to sage-grouse problem. Why is raven removal for sage-grouse protection proposed?** Issue of relative threats to sage-grouse and the role of predation management in sage-grouse management is addressed in Section 1.2.3. See also Sections 2.3.15, 2.3.16, 2.3.30, 2.3.3. Additional information relative to specific questions about sage-grouse also provided in Section 5.1.
- **Efficacy of raven removal for sage grouse protection –** Addressed in Sections 1.2.3, and 2.3.21.

- **WS needs to consider an alternative that only uses nonlethal methods.** Alternative 3 – Non-lethal Management Only WS Program, is analyzed in detail in the EA
- **WS needs to consider an alternative that requires producers to use nonlethal methods.** Alternative 4 – Non-lethal Required before Lethal Control, is analyzed in detail in the EA.
- **Tax money should not be used to pay for PDM.** Addressed in Section 2.3.5.
- **There should be No WS Program**. Alternative 2: No Federal WS-Idaho PDM is analyzed in detail in the EA.
- **Proposed action should be based on scientific fact/sound science.** The EA contains an extensive review of issues relevant to PDM options for WS-Idaho as can be seen in review of the EA and Appendix A: Literature Cited.
- **Where is science to support use of lethal methods?** Data on efficacy of PDM methods is provided in Section 1.2.1, in the Chapter 4 analysis of cost effectiveness for each alternative, and in descriptions of individual methods in Appendix C.
- **EA fails to consider IPM and an exhaustive list of methods.** IPM (Referred to in EA as Integrated Wildlife Damage Management) is addressed in the EA at Section 3.2.1. All classes of methods proposed by the commenter plus additional strategies were presented in Appendix C.
- **Producers should remove carcasses of dead animals to avoid attracting predators.** Carcass removal is one of the many nonlethal methods WS personnel recommend where appropriate (See Appendix C).
- **If there is no WS, then private sector will fill the void and agencies and the public will have little say or information on the PDM that is conducted.** EA analyzes impacts of a No Federal WS-Idaho PDM alternative (Alternative 2) in detail.
- **Animals should be relocated if they persist in being a problem.** Relocation is discussed in EA section 3.3.10 and Appendix C.
- **Methods such as electric fencing, increased human presence, livestock guarding animals and similar nonlethal tools can be effective and should be used and recommended by WS.** These methods are among those which may be used and/or recommended by WS-Idaho under Alternatives 1, 3, 4 and 5. See also Appendix C
- **EA needs to consider cumulative all sources of mortality in impacts assessment**. Chapter 4 analysis of impacts on target species includes a detailed breakout of all known sources of mortality and considers the cumulative impact of all known sources of mortality.
- **When predation is a significant factor for sage-grouse it is usually because of human-caused factors that increase raven numbers. Agencies should focus on nonlethal and passive control methods that provide long-term solutions.** Nonlethal efforts to reduce habitat components that support higher than normal raven densities are addressed in Section 1.2.3 Sage-grouse.
- **Risks associated with use of elevated platforms to reduce some risks of non-target take of DRC-1339 egg baits**. Issue and precautionary measures to reduce risks are addressed in Section 4.2.5.2.
- **Impacts of DRC-1339 on non-target species including T/E species.** Impacts of DRC-1339 on non-target species is addressed extensively in Section 4.2.1.1 – Common raven population information, 4.2.1.2, and 4.2.5.2. These sections also include review of direct, indirect, and cumulative impacts on non-target species. The SOPs in Section 3.4.2.2 establish provisions for the protection of non-target species.

- **Source of methodology for DRC-1339 applications to reduce raven predation on sage-grouse nests.** Methodology comes from Spencer (2002) and is noted in EA section 4.2.1.1 – Common Ravens.
- **Risks of DRC-1339 to eagles** – Addressed in EA Sections 4.2.1.2 and 4.2.5.2.
- **Risks of PDM to Threatened and Endangered Species and other non-target animals** - Addressed in detail for each alternative in Chapter 4.
- **Risks of WS-Idaho use of toxicants to non-target species**. Risks to non-target species associated with WS-Idaho use of toxicants addressed in Section 4.2.1.2.
- **Aesthetic, existence and non-consumptive recreational value of wildlife.** These issues are addressed in detail for each alternative in Chapter 4.
- **Varying Perspectives on Humaneness and Ethics of PDM.** These issues are addressed in detail for each alternative in Chapter 4.
- **Cost Effectiveness of PDM.** This issue is analyzed in detail for each alternative in Chapter 4. Effectiveness is also addressed in Section 2.3.14
- **General Concerns Regarding Impacts to Wilderness.** Potential impacts to Wilderness and other Special Management Areas are addressed in detail for each of the alternatives in Chapter 4.
- **Impacts of proposed sage-grouse protection projects on raven populations.** The impacts are addressed in EA Chapter 5, analysis of impacts on target species for Alternatives 1 and 5.
- **Impacts to human and pet safety** are analyzed in detail for each alternative in Chapter 4.
- **Need to emphasize use of nonlethal methods to address conflicts with ESA-listed grizzly bears.** EA Section 4.2.1.1 - grizzly bears notes that most conflicts involving grizzly bears are addressed using nonlethal methods and that use of lethal methods by WS-Idaho is rare (1 bear removed over period of 2011 – 2015).
- **WS needs to state how it will ensure compliance with policies of each WSA.** EA clearly states that WS coordinates activities on public lands including WSAs with the applicable land management agency during annual work plan meetings.
- **Use of aversive agents to reduce avian predation on sensitive bird populations.** Appendix B discussion of repellents includes conditioned aversion to protect T/E birds.
- **Records of WS trips to specific sites for PDM including trap checks.** All WS activities are recorded in the MIS system.

5.3 ISSUES OUTSIDE SCOPE OF ANALYSIS

Some issues raised during the comment period for the EA pertained to issues outside the scope of the analysis.

- Opinions regarding the ability of IDFG to effectively and appropriately manage wildlife.
- Impacts of trophy hunting on big game populations.
- Need to get humans out of wildlife areas.
- Appropriateness of livestock grazing on public lands and USFS management of grazing permits.
- Efforts to reduce livestock grazing in areas near sage-grouse leks during breeding season based on Coates et al. (2016) determination that raven predation on sage-grouse nests was much higher in areas where cattle were present. Reducing cattle presence in areas near sage-grouse leks and nests could be beneficial in reducing raven predation on sage-grouse nests, but WS-Idaho has no

authority to control location, timing or density of livestock grazing. This type of action would have to be directed by the State, tribes or land management agencies.

- Wolf management and wolf damage management – WS involvement in wolf damage management is addressed in a separate EA (USDA 2011).
- Wilderness management policy and appropriateness of grazing in wilderness areas.
- Impact of range condition on wildlife and livestock.
- Beaver damage management – WS involvement in beaver damage management is addressed in a separate EA (USDA 2004).
- Humaneness of factory farming.
- The role of ranching and farming interests in the development of IDFG management policies.
- Impacts of converting private land to public land.
- The extent to which local communities or national interests should set wildlife management policies.
- Management of damage caused by starlings at feedlots and dairies. Management of damage caused by starlings at feedlots and dairies is addressed in a separate EA (USDA 2006).
- Issues pertaining to the need for and design of the IDFG sage-grouse protection study (IDFG 2013a). WS-Idaho does not have the authority to regulate state actions. The study was developed by IDFG, which has management authority for sage-grouse, at the request of the Idaho state legislature. The associated permit to take ravens in accordance with the study protocol was approved by USFWS, which has management authority for migratory birds, including common ravens. Idaho-WS decision-making authority in this situation is limited to whether or not to participate in the study as designed, and review of the potential environmental consequences of WS-Idaho involvement in this study.
- IDFG decisions to allow or prohibit hunting of sage-grouse or other wildlife species.
- Operation of the Pocatello Supply Depot. Pocatello Supply Depot is not managed by WS-Idaho; supplies provided by the depot are not exclusively used by WS, and supplies are not exclusively for PDM.
- The extent to which public lands ranching, livestock production and agriculture in general contributes to the jobs in Idaho.
- Impacts on bull trout. Concerns relative to impacts on bull trout are related to beaver damage management which is addressed in a separate EA (USDA 2004).
- WS needs to prepare a new programmatic EIS. Need for a programmatic EIS is outside the scope of this analysis. Materials presented in the analysis are sufficient to address impacts associated with alternatives for WS-Idaho involvement in PDM in the state.
- Human dietary choices that include meat consumption and the relative demand for animal production.
- Need to regulate recreational coyote hunting to reduce risks of unintentional shooting of wolves, particularly in areas with low/recolonizing wolf populations.
- Quality of WS NEPA compliance in states other than Idaho.

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APPENDIX A

LITERATURE CITED

ABC (American Bird Conservancy). 2015. Massive conservation coalition calls on Interior Dept. to stop wildlife deaths from feral cats. (http://www.abcbirds.org/newsandreports/releases/140311.html accessed 12 May 2015)

Ables, E. D. 1969. Activity studies of red foxes in southern Wisconsin. Journal of Wildlife Management 33:145-153.

Aebischer, N. J., C. J. Wheatley and H. R. Rose. 2014. Factors associated with shooting accuracy and wounding rate of four managed wild deer species in the UK, based on anonymous field records from deer stalkers. PlosOne 9(10): e109698.

AFWA (Association of Fish and Wildlife Agencies). 2006. Best Management Practices for trapping in the United States – Introduction. http://www.fishwildlife.org/files/Introduction_BMPs.pdf.

Allen, S. H., J. O. Hastings, and S. C. Kohn. 1987. Composition and stability of coyote families and territories in North Dakota. Prairie Naturalist 19:107-114.

Allen, S. H., and A. B. Sargeant. 1993. Dispersal patterns of red foxes relative to population density. Journal of Wildlife Management 57:526-533.

Alt, G. L. 1981. Reproductive biology of black bears of northeastern Pennsylvania. Transactions of the Northeast Section of the Wildlife Society 38:88-89.

Althoff, D. P. 1978. Social and spatial relationships of coyote families and neighboring coyotes. M.S. Thesis, University of Nebraska, Lincoln, Nebraska, USA.

American Pet Products Manufacturers Association. 2016. Pet Industry Market Size and Ownership Statistics. American Pet Products Manufacturers Association, Greenwich, Connecticut, USA.

American Urological Association. 2016. Kidney (renal) failure. http://www.urologyhealth.org/urologic-conditions/kidney-(renal)-failure/sypmptoms.

Andelt, W. F., R. L. Phillips, R. H. Schmidt, and R. B. Gill. 1999. Trapping furbearers: an overview of the biological and social issues surrounding a public policy. Wildl. Society Bulletin 27(1):53-64.

Andelt, W. F. and P. S. Gipson. 1979. Home range, activity, and daily movements of coyotes. Journal of Wildlife Management 43:944-951.

Andersen, D. E., O. J. Rongstad and W. R. Mytton. 1989. Response of nesting red-tailed hawks to helicopter overflights. Condor 91:296-299.

Andrews, R. D., G. L. Storm, R. L. Phillips, and R. A. Bishop. 1973. Survival and movement of transplanted and adopted red fox pups. Journal of Wildlife Management 37:69-72.

Angell, T. 1978. Ravens, crows, magpies, and jays. University of Washington Press, Seattle, Washington, USA.

APHIS (Animal and Plant Health Inspection Service). 1994. Client satisfaction survey: a summary of Animal Damage Control clients served from October 1992 through September 1993. USDA-APHIS-Policy and Program Develop. 15 pp.

APHIS. 2001. Compound DRC-1339 concentrate – staging areas (EPA Reg. No. 56228-30). Tech Note, Wildlife Services. USDA, APHIS. Riverdale, Maryland, USA.

APHIS and USFWS. 2012. Memorandum of Understanding between United States Department of Agriculture Animal and Plant Health Inspection Service and United States Department of the Interior Fish and Wildlife Service. Copy can be obtained from Idaho Wildlife Services, 9134 W. Blackeagle Drive, Boise, Idaho 83709.

Apostolou, A. 1969. Comparative toxicology of the avicides 3-chloro-p-toluidine and 2-chloro-4-acetotoluidide in birds and mammals. Ph.D. dissertation, University of California, Davis, California, USA.

Apostolou, A., and S. A. Peoples. 1971. Toxicity of the avicide 2-chloro-4acetotoluidide in rats: a comparison with it nonacetylated form 3-chloro-p-toluidine. Toxicology and Applied Pharmacology 18:517-521.

Archer, J. 1999. The nature of grief: the evolution and psychology of reactions to loss. Taylor and Francis/Routledge, Florence, Kentucky.

Arrington, O. N., and A. E. Edwards. 1951. Predator control as a factor in antelope management. Transactions of the North American Wildlife Conference 16:179-193.

Ashman, D., G. C. Christensen, M. L. Hess, G. K. Tsukamoto, and M. S. Wickersham. 1983. The mountain lion in Nevada. Nevada Department of Wildlife, Reno, Nevada, USA.

Atzert, S. P. 1971. A review of sodium monofluoroacetate (Compound 1080) its properties, toxicology, and use in predator and rodent control. United States Fish and Wildlife Service, Special Scientific Report (Wildlife) Number 146, United States Department of the Interior, Washington, DC., USA.

Austin, J. E. and C. D. Mitchell. 2010. Characteristics of common raven (*Corvus corax*) predation on sandhill crane (*Grus canadensis*) eggs. Northwestern Naturalist; Spring 2010: 91, 1; ProQuest Natural Science Collection.

Avery, M. L., and D. G. Decker. 1994. Responses of captive fish crows to eggs treated with chemical repellents. Journal of Wildlife Management 58:261-266.

Avery, M. L., M. A. Pavelka, D. L. Bergman, D. G. Decker, C. E. Knittle and G. M. Linz. 1995. Aversive conditioning to reduce raven predation on California least tern eggs. Journal of the Colonial Waterbird Society 18:131-138.

AVMA (American Veterinary Medical Association). 1987. Journal of the American Veterinary Medical Association. Panel Report on the Colloquium on Recognition and Alleviation of Animal Pain and Distress 191:1186-1189.

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

AVMA. 2003. Position statement on abandoned and feral cats. AVMA Membership Directory and Resource Manual. Shaumburg, Illinois, 2003:74.

AVMA. 2004. Animal Welfare Forum: Management of Abandoned and Feral Cats. Journal of the American Veterinary Medical Association. Vol. 225, No. 9, November 1, 2004.

AVMA. 2007. AVMA Guidelines on Euthanasia. 2007 report of the panel on euthanasia. AVMA, Schaumburg, IL.

AVMA. 2013. AVMA Guidelines for the Euthanasia of Animals: 2013 Edition. AVMA, Schaumburg, IL. 102 pp.

Bailey, T. N. 1974. Social organization in a bobcat population. Journal of Wildlife Management 38:435- 446.

Baker, R. O., and R. M. Timm. 1998. Management of conflicts between urban coyotes and humans in southern California. Proceeding of the Vertebrate Pest Conference 18:299-312.

Baker, P. J., B. Luigi, S. Harris, G. Saunders, and P. C. L. White. 2008. Terrestrial carnivores and human food production: impact and management. Mammal Review 38:123-166.

Balda, R. P. 2002. Pinyon jay. No. 605, *in* The Birds of North America Online. A. Poole, ed. Acad. Nat. Sci., Phil., Penn. and Amer. Ornithol. Union, Wash., D.C.

Balda, R. P., and A. C. Kamil. 1989. A comparative study of cache recovery by 3 corvid species. Animal Behavior 38:486-495.

Ballard, W. B., D. Lutz, T. W. Keegan, L. H. Carpenter, and J. C. deVos, Jr 2003. Deer-predator relationships: A review of recent North American studies with emphasis on mule deer and black- tailed deer. Pages 177-218 *in* J. C. deVos, Jr., M. R Conover, and N. F. Herdick, editors. Mule Deer Conservation: Issues and Management Strategies. Jack H. Berryman Institute Press, Logan, Utah, USA.

Balser, D. S., D. H. Dill, and H. K. Nelson. 1968. Effect of predator reduction on waterfowl nesting success. Journal of Wildlife Management 32:669-682.

Bandy, L. W. 1965. The colonization of artificial nesting structures by wild mallards and black ducks. Thesis, Ohio State University, Columbus, Ohio, USA.

Barrett, M. W. 1978. Pronghorn fawn mortality in Alberta. Proceedings of the Pronghorn Antelope Workshop 8:429-444.

Bartush, W. S. 1978. Mortality of white-tailed deer fawns in the Wichita Mountains, Comanche County, Oklahoma, Part II. Thesis, Oklahoma State University, Stillwater, Oklahoma, USA.

Batterson, W. M., and W. B. Morse. 1948. Oregon sage-grouse. Oregon Fauna Series Number 1, Oregon State Game Commission, Portland, Oregon, USA.

Baxter, R. J., K. D. Bunnell, J. T. Flinders, and D. L. Mitchell. 2007. Impacts of predation on greater sage-grouse in Strawberry Valley, Utah. Pages 258–269 *in* Transactions of the 72nd North American Wildlife and Natural Resources Conference, March 2007, 11 pp.

BBS (Black Bear Society). 2011. Black bear populations by state. Black Bear Society. (http:blackbearsociety.org/bearPopulationbyState.html, accessed 20 March 2015)

Beale, D. M. 1978. Birth rate and fawn mortality among pronghorn antelope in western Utah. Proceedings of the Pronghorn Antelope Workshop 8:445-448.

Beale, D. M., and A. D. Smith. 1973. Mortality of pronghorn antelope fawns in western Utah. Journal of Wildlife Management 37:343-352.

Beasom, S. L. 1974*a*. Relationships between predator removal and white-tailed deer net productivity. Journal of Wildlife Management 38:854-859.

Beasom, S. L. 1974*b*. Intensive short-term predator removal as a game management tool. Transactions of the North American Wildlife Conference 39:230-240.

Beauchamp, T. L., and R. G. Frey, eds. 2011. The Oxford handbook of animal ethics. Oxford University Press, New York.

Bedrosian, B. 2005. Nesting and post-fledging ecology of the common raven in Grand Teton National Park. M.S. Thesis. Arkansas State University, Jonesboro, Arkansas, USA.

Bedrosian, B., D. Craighead, and R. Crandall. 2012. Lead exposure in bald eagles from big game hunting, the Continental implications and successful mitigation efforts. PlosOne 7(12): e51978.

Beier, P. 1992. Cougar attacks on humans: an update and some further reflections. Proceedings of the Vertebrate Pest Conference 15:365-367.

Bekoff, M., and M. C. Wells. 1980. The social ecology of coyotes. Scientific American 242:130-148.

Bentz, T., S. Lapidge, D. Dall, and R. G. Sinclair. 2007. Managing starlings in Australia – Can DRC-1339 be the answer? Pages 361 to 364 *in* G. W. Witmer, W. C. Pitt, and K. A. Fagerstone, editors. Proceedings from an International Symposium – Managing Vertebrate Invasive Species. USDA/APHIS/WS, National Wildlife Research Center, Fort Collins, Colorado, USA.

Berger, K. M. 2006. Carnivore-livestock conflicts: Effects of subsidized predator control and economic correlates on the sheep industry. Conservation Biology 20:751-761.

Berger, K. M. and M. M. Conner. 2008. Recolonizing wolves and mesopredator suppression of coyotes: Impacts on pronghorn populations. Ecological Applications 18:599-612.

Berger, K. M., E. M. Gese and J. Berger. 2008. Indirect effects and traditional trophic cascades: a test involving wolves, coyotes and pronghorn. Ecology 89:818-828.

Berger, J., P. B. Stacey, L. Bellis, and M. P. Johnson. 2001. A mammalian predator-prey imbalance: grizzly bear and wolf extinction affect avian neotropical migrants. Ecological Applications 11:947-960.

Bergerud, A. T. 1988*a*. Population ecology of North American grouse. Pages 578-685 *in* A. T. Bergerud and M. W. Gratson, editors. Adaptive strategies and population ecology of northern grouse, volume II: theory and synthesis. University of Minnesota Press, Minneapolis, USA.

Bergerud, A. T. 1988*b*. Increasing the numbers of grouse. Pages 686-731 *in* A. T. Bergerud and M. W. Gratson, editors. Adaptive strategies and population ecology of northern grouse, volume II: theory and synthesis. University of Minnesota Press, Minneapolis, USA.

Bergman, D. L., S. W. Breck, and S. C. Bender. 2009. Dogs gone wild: Feral dog damage in the United States. Pages 177-183 *in* J. R. Boulanger, editor, Proceedings of the 13th Wildlife Damage Management Conference.

Bergstrom, B. J., L. C. Arias, A. D. Davidson, A. W. Ferguson, L. A. Randa, and S. R. Sheffield. 2014. License to kill: Reforming federal wildlife control to restore biodiversity and ecosystem function. Conservation Letters 7:131-142.

Beschta, R. L., D. L. Donahue, D. A. DellaSala, J. J. Rhodes, J. R. Karr, M. H. O'Brien, T. L. Fleischner, and C. D. Williams. 2013. Adapting to climate change on Western public lands: addressing the ecological effects of domestic, wild and feral ungulates. Environmental Management 51:474-491.

Beschta, R. L. and W. J. Ripple. 2013. Are wolves saving Yellowstone's aspen? A landscape-level test of a behaviorally mediated trophic cascade – Comment. Ecology 94:1420-1425.

Beschta, R. L. and W. J. Ripple. 2012a. The role of large predators in maintaining riparian plant communities and river morphology. Geomorphology 157-158:88-98.

Beschta, R. L. and W. J. Ripple. 2012b. Berry-producing shrub characteristics following wolf reintroduction in Yellowstone National Park. Forest Ecology and Management 276:132-138.

Beschta, R. L. and W. J. Ripple. 2009. Large predators and trophic cascades in terrestrial ecosystems of the western United States. Biological Conservation 142:2401-2414.

Beschta, R. L. and W. J. Ripple. 2008. Wolves, trophic cascades and rivers in the Olympic National Park, USA. Ecohydrology 1:118-130.

Beschta, R. L. and W. J. Ripple. 2006. River channel dynamics following extirpation of wolves in northwestern Yellowstone National Park, USA. Earth Surface Processes and Landforms. DOI: 10.1002/esp

Beyer, W. N., J. Dalgarn, S. Dudding, J. B. French, R. Mateo, J. Miesner, L. Sileo and J. Spann. 2004. Zinc and lead poisoning in wild birds in the tri-state mining district (Oklahoma, Kansas and

Missouri). Archives of Environmental Contamination and Toxicology 48:108-117.

Bishop, R. C. 1987. Economic values defined. Pages 24-33 *in* D. J. Decker and G. R. Goff, editors. Valuing wildlife: economic and social perspectives. Westview, Boulder, Colorado, USA.

Bjerkås, I., S. F. Mohn, and J. Presthus. 1984. Unidentified cyst-forming sporozoon causing encephalomyelitis and myositis in dogs. Zeitschrift fur Parasitenkunde 70:271–274.

Bjorge, R. R., J.R. Gunson, and W.M. Samuel. 1981. Population characteristics and movements of striped skunks (*Mephitis mephitis*) in central Alberta. Canadian Field Naturalist 95:149-155.

BLM (Bureau of Land Management). 1991. Final environmental impact statement-Colorado oil and gas lease and development. U.S. Department of the Interior-BLM, Colorado State Office [2850 Youngfield St., Lakewood, CO 80215], 417 pp + App. A-Q.

BLM. 2002. EMS TRANSMISSION instruction memorandum No. 2004-140 revisions and clarifications to H-8550-1. Interim Management Policy for Lands Under Wilderness Review, as it Relates to Wildlife Management.

BLM. 2012. BLM manual 6330 – management of BLM wilderness study areas. United States Bureau of Land Management. Washington D.C., USA.

BLM. 2015*a*. Idaho's wild horses. Bureau of Land Management. (http://www.blm.gov/id/st/en/prog/wild_horses_.html, accessed 17 April 2015.)

BLM. 2015*b*. Wilderness. U.S. Bureau of Land Management. (http://www.blm.gov/id/st/en/prog/blm_special_areas/wilderness.html, accessed 24 April 2015)

BLM. 2015*c*. Wilderness study areas. U.S. Bureau of Land Management. (http://www.blm.gov/ca/st/en/prog/wilderness/wsa.html, accessed 1 May 2015)

BLM. 2015*d*. Areas of critical environmental concern (ACECs). U.S. Bureau of Land Management. (http://www.blm.gov/id/st/en/environmental_education/science-research/ACEC.print.html, accessed 24 April 2015)

BLM. 2015*e*. Morley Nelson Snake River birds of prey National conservation area. U.S. Bureau of Land Management. (http://www.blm.gov/id/st/en/prog/blm_special_areas/birds_of_prey_nca.html, accessed 1 May 2015)

BLM. 2015*f*. National monuments. U.S. Bureau of Land Management. (http://www.blm.gov/wo/st/en/prog/blm_special_areas/NLCS/monuments, accessed 1 May 2015).

Blunden, J., and D. S. Arndt, Eds. 2013. State of the climate in 2012. Bulletin of the American Meteorological. Society 94:S1-S238.

Boarman, W.I. 1993. When a native predator becomes a pest: a case study. Pages 191-206 *in* Majumdar, S. K., E. W. Miller, D. E. Baker, E. K. Brown, J. R. Pratt, and R. F. Schmalz, editors. Conservation and Resource Management.

Boarman, W. I. and B. Heinrich. 1999. Common raven. *in* Birds of North America, No. 476, Cornell Lab. Ornithology and the Academy of Natural Science, A. Poole and F. Gill eds. 31 pp.

Boddicker, M. L. 1980. Managing Rocky Mountain Furbearers. Colorado Trapper's Assoc. Training Manual, 181 pp.

Bodenchuk, M. J., and D. J. Hayes. 2007. Predation impacts and management strategies for wildlife protection. Pages 221-264 *in* A. M. T. Elewa, editor. Predation in organisms: a distinct phenomenon. Springer-Verlag, Berlin, Germany.

Bodenchuk, M. J., J. R. Mason, and W. C. Pitt. 2002. Economics of predation management in relation to agriculture, wildlife, and human health and safety. Pages 80-90 *in* Clark, L., J. Hone, J. A. Shivik, R. A. Watkins, K. C. Vercauteren, and J. K. Yoder, editors. Human conflicts with wildlife: economic considerations. Proceedings of the Third NWRC Special Symposium. National Wildlife Research Center, Fort Collins, Colorado, USA.

Bodie, W. L. 1978. Pronghorn fawn mortality in the upper Pahsimeroi River drainage of central Idaho. Proceedings of the Pronghorn Antelope Workshop 8:417-428.

Bourne, J., and M. Dorrance. 1982. A field test of lithium chloride aversion to reduced coyote predation on domestic sheep. Journal of Wildlife Management 46:235-239.

Bradley, E. H., H. S. Robinson, E. E. Bangs, K. Kunkel, M. D. Jimenez, J. A. Gude, and T. Grimm. 2015. Effects of wolf removal on livestock depredation recurrence and wolf recovery in Montana, Idaho and Wyoming. Journal of Wildlife Management 79:1337-1346.

Brasheres, J. S., L. R. Prugh, C. J. Stoner and C. W. Epps. 2010. Ecological and conservation implications of mesopredator release. Pages 221-240 *in* J. Terborgh and J. A. Estes (eds.) Trophic Cascades: Predators, Prey and the Changing Dynamics of Nature, Island Press, Washington, D.C.

Bromley, C and E. M. Gese. 2001*a*. Surgical sterilization as a method of reducing coyote predation on domestic sheep. Journal of Wildlife Management 65:510-519.

Bromley, C. and E. M. Gese. 2001*b*. Effects of sterilization on territory fidelity and maintenance, pair bonds, and survival rates of free-ranging coyotes. Canadian Journal of Zoology 79:386-392.

Brown, D. E. and M. R. Conover. 2011. Effects of large-scale removal of coyotes on pronghorn and mule deer productivity and abundance. Journal of Wildlife Management 75:876-882.

Bui, T. D. 2009. The effects of nest and brood predation by common ravens (*Corvus corax*) on greater sage-grouse (*Centrocercus urophasianus*) in related to land use in western Wyoming. M. S. Thesis, University of Washington, Seattle, Washington, USA.

Bui, T. D., J. M. Marzluff, and B. Bedrosian. 2010. Common raven activity in relation to land use in western Wyoming: implications for greater sage-grouse reproductive success. Condor 112:65-78.

Bumann, G. B., and D. F. Stauffer. 2002. Scavenging of ruffed grouse in the Appalachians: influences and implications. Wildlife Society Bulletin 30:853-860.

Bunnell, K. D., and J. T. Flinders. 1999. Restoration of sage-grouse in Strawberry Valley, Utah 1998-99 report. Unpublished report to: Utah Reclamation Mitigation and Conservation Commission. Brigham Young University, Provo, Utah, USA.

Burke, T. W., and W. F. Rowe. 1992. Bullet ricochet: a comprehensive review. Journal of Forensic Sciences 37:1254-1260.

Burkepile, N. A., K. P. Reese, and J. W. Connelly. 2001. Mortality patterns of sage-grouse chicks in southeast Idaho. Abstract of presentation made at 2001 Annual Meeting of the Idaho Chapter of The Wildlife Society, Boise, USA.

Burns, R. J. 1980. Evaluation of conditioned predation aversion for controlling coyote predation. Journal of Wildlife Management 44:938-942.

Burns, R. J. 1983. Coyote predation aversion with lithium chloride: management implications and comments. Wildlife Society Bulletin 11:128-133.

Burns, R. J. and G. E. Connolly. 1980. Lithium chloride aversion did not influence prey killing in coyotes. Proceeding of the Vertebrate Pest Conference 9:200-204.

Burns, R. J., and G. E. Connolly. 1985. A comment on "coyote control and taste aversion." Appetite 6:276-281.

Burns, R. J., G. E. Connolly, and P. J. Savarie. 1988. Large livestock protection collars effective against coyotes. Proceedings of the Vertebrate Pest Conference 13:215-219.

Caffrey, C. 1992. Female-biased delayed dispersal and helping in American crows. Auk 109:609-619.

Cain, S., A. Kadlec, D. L. Allen, R.A. Cooley, M. C. Hornocker, A. S. Leopold, and F. H. Wagner. 1972. Predator control-1971/report to the Council on Environmental Quality and the Department of the Interior by the Advisory Committee on Predator Control. Council on Environmental Quality and U.S. Department of the Interior, Washington, D.C., USA.

Cain, S. 2012. Grand Teton National Park recreational use. Page 45 *in* F. T. van Manen, M. A. Haroldson, and K. West, editors. Yellowstone grizzly bear investigations: annual report of the Interagency Grizzly Bear Study Team, 2011. U.S. Geological Survey, Bozeman, Montana, USA.

Cain, S. 2013. Grand Teton National Park recreational use. Page 48 *in* F. T. van Manen, M. A. Haroldson, and K. West, editors. Yellowstone grizzly bear investigations: annual report of the Interagency Grizzly Bear Study Team, 2012. U.S. Geological Survey, Bozeman, Montana, USA.

Cain, S. 2014. Grand Teton National Park recreational use. Page 46 *in* F. T. van Manen, M. A. Haroldson, K. West, and S. C. Soileau, editors. Yellowstone grizzly bear investigations: annual report of the Interagency Grizzly Bear Study Team, 2013. U.S. Geological Survey, Bozeman, Montana, USA.

Camenzind, F. J. 1978. Behavioral ecology of coyotes on the National Elk Refuge, Jackson, Wyoming. Pages 267-294 *in* M. Bekoff, editor. Coyotes: Biology, behavior and management. Academic Press, New York.

Caudell, J. N., S. R. Stopak and P. C. Wolf. 2012. Lead-free high-powered rifle bullets and their applicability in wildlife management. Human-Wildlife Interactions. 6:105-111.

CDC (Center for Disease Control). 1990. Morbidity and mortality weekly report. Compendium of rabies control. 39, No. RR-4:6.

CDC. 2002. Raccoon roundworm encephalitis - - - Chicago, Illinois, and Los Angeles, California, 2000. Centers for Disease Control and Prevention, Atlanta, Georgia, USA. (http:www.cdc.gov/mmwr/preview/mmwrhtml/mm5051a1.htm, accessed 5 June 2015).

CDFG (California Department of Fish and Game). 1991. California Department of Fish and Game. Final Environmental Document - bear hunting. Sections 265, 365, 367, 367.5. Title 14 Calif. Code of Regs. Calif. Dept. of Fish and Game, State of California, April 25, 1991. 13pp.

CDFG. 2001. Bear hunting. State of California, Resources Agency, Department of fish and game. Section 265, 365, 366, 367, 367.5, Title 14 California Code of Regulations.

CEQ (Council for Environmental Quality). 2014. Revised draft guidance for greenhouse gas emissions and climate change impacts in NEPA reviews. https://www.whitehouse.gov/sites/default/files/docs/nepa_revised_draft_ghg_guidance_searchable.pdf.

Chamberlain-Auger, J. A., P. J. Auger, and E. G. Strauss. 1990. Breeding biology of American crows. Wilson Bulletin 102:615-622.

Chapron, G and A. Treves. 2016. Blood does not buy goodwill: allowing culling increases poaching of a large carnivore. Proceedings of the Royal Society Biological Sciences Series 283:20152939.

Chessness, A. A., M. M. Nelson, and W. H. Longley. 1968. The effect of predator removal on pheasant reproductive success. Journal of Wildlife Management 32:683-697.

Chitty, D. 1967. The natural selection of self-regulatory behavior in animal populations. Proceedings of the Ecological Society. Australia 2:51-78.

Clark, F. W. 1972. Influence of jackrabbit density on coyote population change. Journal of Wildlife Management 36:343-356.

Clausen, J. L., and N. Korte. 2009. Environmental fate of tungsten from military use. Science of the Total Environment 407:2887-2893.

Coates, P. S. 2001. Movement, survivorship, and reproductive behavior of Columbian sharp-tailed grouse translocated to Nevada. Thesis, University of Nevada, Reno, USA.

Coates, P. S. 2007. Greater sage-grouse (*Centrocercus urophasianus*) nest predation and incubation behavior. Ph.D. Dissertation. Idaho State University, Pocatello, Idaho, USA.

Coates, P. S., and D. J. Delehanty. 2001. Progress report: Columbian sharp-tailed grouse reintroduction in northeastern Nevada. Nevada Division of Wildlife and University of Nevada, Reno, Nevada, USA

Coates, P. S., and D. J. Delehanty. 2004. The effects of raven removal on sage-grouse nest success. Vertebrate Pest Conference 21:17-20.

Coates, P. S., and D. J. Delehanty. 2010. Nest predation of greater sage-grouse in relation to microhabitat factors and predators. Journal of Wildlife Management 74:240-248.

Coates, P. S., J. O. Spencer, Jr., and D. J. Delehanty. 2007. Efficacy of CPTH-treated egg baits for removing ravens. Human-Wildlife Conflicts 1:224-234.

Coates, P. S., J. W. Connelly and D. J. Delehanty. 2008. Predators of greater sage-grouse nests identified by video monitoring. Journal of Field Ornithology 79:421-428.

Coates, P. S., S. M. Murphy, B. E. Brussee, B. Gustafson, M. L. Casazza, and D. J. Delehanty. 2013. Population density and resource selection of common ravens in Curlew Valley, Idaho. U.S. Geological Survey, draft report.

Coates, P.S., Howe, K. B., Casazza, M. L., and D.J. Delehanty. 2014. Common raven occurrence in relation to energy transmission line corridors transiting human-altered sagebrush steppe. Journal of Arid Environments 111: 68–78.

Coates P. S., B. E. Brussee, K. B. Howe, K. B. Gustafson, M. L. Casazza, and D. J. Delehanty. 2016. Landscape characteristics and livestock presence influence common ravens: relevance to greater sage-grouse conservation. Ecosphere 7(2):e01203. 10.1002/ecs2.1203.

Collins, C. P. 2004. Ecology of Columbian sharp-tailed grouse breeding in coal mine reclamation and native upland cover types in northwestern Colorado. Thesis, University of Idaho, Moscow, USA.

Conklin and de Decker Associates. 2015. CO2 Emissions and Offset Calculator. Online. https://www.conklindd.com/CDALibrary/CO2Calc.aspx Accessed 10 June 2015.

Connelly, J. W., M. W. Gratson, and K. P. Reese. 1998. Sharp-tailed grouse (*Tympanuchus phasianellus*). Account 354 *in* A. Poole and F. Gill, editors. The birds of North America. The Academy of Natural Sciences, Philadelphia, Pennsylvania, and The American Ornithologists' Union, Washington, D.C., USA.

Connelly, J. W., and C. E. Braun. 1997. Long-term changes in sage-grouse (*Centrocercus urophasianus*), populations in western North America. Wildlife Biology 3:229-234.

Connelly, J. W., S. T. Knick, M. A. Schroeder, and S. J. Stiver. 2004. Conservation assessment of greater sage-grouse and sagebrush habitats. Western Association of Fish and Wildlife Agencies. Unpublished Report. Cheyenne, Wyoming, USA.

Connelly, J. W., M. A. Schroeder, A. R. Sands, and C. E. Braun. 2000. Guidelines to manage sage-grouse populations and their habitats. Wildlife Society Bulletin 28:967-985.

Conner, M. M. 1995. Identifying patterns of coyote predation on sheep on a northern California ranch. Thesis, University of California, Berkeley, USA.

Conner, M. M., M. M. Jaeger, T. J. Weller, and D. R. McCullough. 1998. Effects of coyote removal on sheep depredation in northern California. Journal of Wildlife Management 62:690-699.

Connolly, G. E. 1978. Predators and predator control. Pages 369-394 *in* J. L. Schmidt and D.L. Gilbert, editors. Big Game of North America. Stackpole, Harrisburg, Pennsylvania, USA.

Connolly, G. E. 1981. On cost effectiveness of coyote control to protect livestock. Proceedings of the Symposium on Wildlife Livestock Relationships, Department of Wildlife Resources, University of Idaho, Moscow, Idaho, USA.

Connolly, G. E. 1988. M-44 sodium cyanide ejectors in the animal damage control program, 1976-1986. Proceedings of the Vertebrate Pest Conference 13:220-225.

Connolly, G. E. 1992. Coyote damage to livestock and other resources. Pages 161-169 *in* A.H. Boer, editor. Ecology and management of the eastern coyote. University of New Brunswick, Fredericton, New Brunswick, Canada.

Connolly, G. E. 1995. The effects of control on coyote populations another look. Pages 23-29 *in* D. Rollins, C. Richardson, T. Blankenship, K. Canon, S. Henke, editors. Proceedings of the Symposium on Coyotes in the Southwest: A Compendium of our Knowledge. Texas Parks and Recreation Department.

Connolly, G. E., and R. J. Burns. 1990. Efficacy of compound 1080 livestock protection collars for killing coyotes that attack sheep. Proceedings of the Vertebrate Pest Conference 14:269-276.

Connolly, G. E., and W. M. Longhurst. 1975. The effects of control on coyote populations. University of California, Division of Agricultural Science, Davis, California, USA.

Connolly, G. E. and B. W. O'Gara. 1987. Aerial hunting takes sheep-killing coyotes in Western Montana. Proceedings of the Eighth Great Plains Wildlife Damage Control Workshop 8:184-188.

Connolly, G. E., R. M. Timm, W. E. Howard, W. M. Longhurst. 1976. Sheep killing behavior of captive coyotes. Journal of Wildlife Management 40:400-407.

Connolly, G. E., R. E. Griffiths, Jr., and P. J. Savarie. 1978. Toxic collar for control of sheep-killing coyotes: A progress report. Proceedings of the Vertebrate Pest Conference 8:197-205.

Conomy, J. T., J. A. Collazo, J. A. Dubovsky, W. J. Fleming. 1998. Dabbling duck behavior and aircraft activity in coastal North Carolina. Journal of Wildlife Management 62:1127-1134.

Conover, M.R., J.S. Borgo, R.E. Dritz, J.B. Dinkins, and D.K. Dahlgren. 2010. Greater sage-grouse select nest sites to avoid visual predators but not olfactory predators. Condor 112: 331–336.

Conover, M. R., J. G. Francik, and D. E. Miller. 1977. An experimental evaluation of aversive conditioning for controlling coyote predation. Journal of Wildlife Management 41:775-779.

Cook, R. S., M. White, D. O. Trainer, and W. C. Glazener. 1971. Mortality of young white-tailed deer fawns in south Texas. Journal of Wildlife Management 35:47-56.

Coolahan, C. 1990. The use of dogs and calls to take coyotes around dens and resting areas. Proceedings of the Vertebrate Pest Conference 14:260-262.

Costello, R. B. ed. 1992. Random House Webster's College Dictionary. Random House, Inc., New York, NY.

Cote, I. M., and W. J. Sutherland. 1997. The effectiveness of removing predators to protect bird populations. Conservation Biology 11:395-405.

Courchamp F., J. L. Chapuis, and M. Pascal. 2003. Mammal invaders on islands: impact, control and control impact. Biological Review 78:347-383.

Cowan, P., L. Booth, J. Duckworth, and A. Glen. 2010. Future options for management of rooks (*Corvus frugilegus*). Landcare Research Report Prepared for Horizons Regional Council, Palmerston North, New Zealand. http://www.landcareresearch.co.nz/.

Cowardin, L. M., D. S. Gilmer, and C. W. Shaiffer. 1985. Mallard recruitment in the agricultural environment of North Dakota. Wildlife Monographs 92.

Crabtree, R. L., and J. W. Sheldon. 1999. Coyotes and canid coexistence in Yellowstone. Pages 127-163 *in* T. W. Clark, A. P. Curlee, S. C. Minta, and P. M. Karieva, editors. Carnivores in Ecosystems, The Yellowstone Experience. Yale University Press, New Haven, Connecticut. USA.

Craig, J. R., J. D. Rimstidt, C. A. Bonnaffon, T. K. Collins, and P. F. ScanIon. 1999. Surface Water Transport of Lead at a Shooting Range. Bull. Environ. Contam. Toxicol. 63:312-319.

Creed, R. F. S. 1960. Gonad changes in the wild red fox (*Vulpes vulpes crucigera*). Journal of Physiology (London) 151:19-20.

Crooks, K. R., and M. E. Soule´. 1999. Mesopredator release and avifaunal extinctions in a fragmented system. Nature 400:563-566.

Crowe, D. M. 1975. A model for exploited bobcat populations in Wyoming. Journal of Wildlife Management 39:408-415.

Cunningham, C. J., E.W. Schafer, and K. McConnell. 1979. DRC-1339 and DRC-2698 residues in starlings: preliminary evaluation of their effects on secondary hazard potential. Wildlife Damage Management, Internet Center for Bird Control Seminars Proceedings, University of Nebraska, Lincoln, Nebraska, USA.

Curry, Robert L, A. T. Peterson, and T. A. Langen. 2002. Western scrub jay. No. 712, *in* The Birds of North America Online. A. Poole, ed. Acad. Nat. Sci., Phil., Penn. and Amer. Ornithol. Union, Wash., D.C.

Cypher, B. L. 2003. Foxes (*Vulpes* spp. *Urocyon* spp. and *Alopex lagopus*). Pages 6511-546 *in* G. A. Feldhamer, B. C. Thompson, and J. A Chapman editors. Wild mammals of North America. John Hopkins University Press, Baltimore, Maryland, USA.

Danner, D. A. 1976. Coyote home range, social organization, and scent post visitation. M.S. Thesis, University of Arizona, Tucson, Arizona, USA.

Danner, D. A. and N. S. Smith. 1980. Coyote home range, movements, and relative abundance near cattle feedyard. Journal of Wildlife Management 44:484-487.

Davison, R. P. 1980. The effects of exploitation on some parameters of coyote populations. Dissertation, Utah State University, Logan, USA.

Darrow, P. A., and J. A. Shivik. 2008. A pilot evaluation of trap monitors by the USDA Wildlife Services operational program. Proceedings of the Vertebrate Pest Conference. 23:213-217.

Dawes, J. 2006. Is the use of DRC-1339 humane? Unpublished Pestat Ltd report. March 2006. 5pp.

DeCino, T. J., D. J. Cunningham, and E. W. Shafer. 1966. Toxicity of DRC-1339 to starlings. Journal of Wildlife Management 30:249-253.

Decker, D. J., and G. R. Goff. 1987. Valuing wildlife: economic and social perspectives. Westview Press, Boulder, Colorado, USA.

DeLiberto, T. J., E. M. Gese, F. F. Knowlton, J. R. Mason, M. R. Conover, L. Miller, R. H. Schmidt, and M. K. Holland. 1998. Fertility control in coyotes: is it a potential management tool? Proceedings of the Vertebrate Pest Conference 18:144-149.

Delta Waterfowl. 2014. Predator management. Obtained from website: http//:www.deltawaterfowl.org/what-we-do/management.html.

Diamond, J. 1992. Must we shoot deer to save nature? Natural History. New York, August 2.

Dickens, M. J., D. J. Delehanty, and L. M. Romero. 2010. Stress: An inevitable component of animal translocation. Biological Conservation 143:1329-1341.

Dickinson, R. J. 1998. The secret lives of crows. Living Bird:30-34.

Digital Atlas of Idaho Project. 2015. Mammals. http://imnh.isu.edu/digitalatlas/bio/mammal/mamfram.htm

Dinkins, J. B., M. R. Conover, C. P. Kirol, and J. L. Beck. 2012. Greater sage-grouse (*Centrocercus urophasianus*) select nest sites and brood sites away from avian predators. Auk 129: 600–610.

Dinkins, J. B. 2013. Common raven density and greater sage-grouse nesting success in southern Wyoming: Potential conservation and management implications. Ph.D. dissertation. Utah State University, Logan, Utah, USA.

Dinkins, J. B., J. R. Conover, C. P. Kirol, J. L. Beck, and S. N. Frey. 2014. Greater sage-grouse (*Centrocercus urophasianus*) select habitat based on avian predators, landscape composition, and anthropogenic features. Condor 116: 629–642.

Dinkins, J. B., M. R. Conover, C. P. Kirol, J. L. Beck, and S. N. Frey. 2016. Effects of common raven and coyote removal and temporal variation in climate on greater sage-grouse nesting success. Biological Conservation 202(2016) 50-58.

Douglas, C. L., and D. M. Leslie Jr. 1999. Management of bighorn sheep. Pages 238-262 *in* R. Valdez and P. R. Krausman, editors, Mountain sheep of North American. University of Arizona, Tucson, Arizona, USA.

Dorn, J. L. 1972. The common raven in Jackson Hole, Wyoming. M.S. Thesis, University of Wyoming, Laramie.

Dubey, J. P., J. L. Carpenter, C. A. Speer, M. J. Topper, and A. Uggla. 1988. Newly recognized fatal protozoan disease of dogs. Journal of American Veterinary Medical Association 192:1269–1285.

Dubey, J.P., G. Schares, and L. M. Ortega-Mora. 2007. Epidemiology and control of neosporosis and neospora caninum. Clinical Microbiology Review, April 2007, p. 323–367

Eccleston, C. H. 1995. NEPA: Determining when an analysis contains sufficient detail to provide adequate coverage for a proposed action. Federal Facilities Environmental Journal, Summer.

Edwards, L. L. 1975. Home range of coyotes in southern Idaho. M.S. Thesis. Idaho State University, Pocatello, Idaho, USA.

Eisemann, J. D., G. M. Linz, and J. J. Johnston. 2001. Non-target hazard assessment of using DRC-1339 avicide to manage blackbirds in sunflowers. American Chemical Society. 197-211.

Eisler, R. 1998. Nickel hazards to fish, wildlife and invertebrates: a synoptic review. Contaminant Hazard Reviews Report No. 34. USDI Geological Survey, Patuxent Wildlife Research Center, Patuxent, MD.

Ellins, S.R., and G.C. Martin. 1981. Olfactory discrimination of lithium chloride by the coyote (*Canis latrans*). Behavioral and Neural Biology 31:214-224.

Ellis, D. H. 1981. Responses of raptorial birds to low-level jet aircraft and sonic booms. Results of the 1980-81 joint U.S. Air Force-U.S. Fish and Wildlife Service Study. Institute for Raptor Studies, Oracle, Arizona, USA.

Emlen, J. T. 1942. Notes on a western colony of western crows. Bird-banding 13:143-154. Environmental Working Group. 2001. Lead pollution at outdoor firing ranges. http://static.ewg.org/reports/2001/LeadPollutionAtOutdoorFiringRanges.pdf. Accessed 08 June 2015.

Engeman, R. M., H. W. Krupa, and J. Kern. 1997. On the use of injury scores for judging the acceptability of restraining traps. Journal of Wildlife Research 2(2): 124-127.

EPA. 1991. Reregistration Eligibility Decision (R.E.D.) Facts: Inorganic nitrate/nitrite (sodium and potassium nitrates). 738-F-91-103. Available at: http://www.epa.gov/oppsrrd1/REDs/factsheets/4052fact.pdf, United States Environmental Protection Service, Pesticides and Toxic Substances.

EPA (U.S. Environmental Protection Agency). 2000. How to Evaluate Alternative Cleanup Technologies for Underground Storage Tank Sites: A Guide for Corrective Action Plan Reviewers. Publication obtained online at http://www.epa.gov/cgi-bin/claritgw.

EPA. 2006. Reregistration Eligibility Decision (R.E.D.) for Sodium Carbonate; Weak Mineral Bases. EPA 739-R-06-001. Last accessed August 28, 2014 at http://www.epa.gov/oppsrrd1/REDs/sodium_carbonate_red.pdf, United States Environmental Protection Agency, Prevention, Pesticides, and Toxic Substances.

EPA. 2008. Problem Formulation, For Ecological Risk Assessment, For Carbon Dioxide, and Gas Fumigant Producing Cartridges: Sawdust, Sodium Nitrate, Potassium Nitrate and Sulfur. Case Number 4019, 4052, 0031. Last accessed August 28, 2014 at: http://www.regulations.gov/#!documentDetail;D=EPA-HQ-OPP-2007-1118-0005, United States Environmental Protection Agency, Office of Pesticide Programs, Environmental Fate and Effects Division.

EPA (U.S. Environmental Protection Agency). 2016. Region 5 Superfund. Ecological Toxicity Information. https://archive.epa.gov/reg5sfun/ecology/web/html/toxprofiles.html

EPA (U.S. Environmental Protection Agency). 2009. Response to SINAPU et al. petition to the Environmental Protection Agency for Suspension and Cancellation of M-44 Sodium Cyanide Capsules and Sodium Floroacetate (Compound 1080) Livestock Protection Collars.

EPA. 2010. Climate change – Greenhouse gas emissions in the home. Retrieved from http://epa.gov/climatechange/emissions/ind_home.html last accessed March 13, 2014.

EPA. 2013. Climate change: ecosystems http://www.epa.gov/climatechange/impacts-adaptation/ecosystems.html#Range last accessed Dec. 6, 2013.

Estes, J. A., J. Terborgy, J. S. Brashares, M. E. Power, J. Berger, W. J. Bond, S. R. Carpenter, T. E Essington, R. D. Holt, J. B. C. Jackson, R. J. Marquis, L. Oksanen, T. Oksanen, R. T. Paine, E. K. Pikitch, W. J. Ripple, S. A. Sandin, M. Scheffer, T. W Schoener, J. B. Shurin, A. R. E. Sinclair, M. E. Soulé, R. Virtanen, and D. A. Wardle. 2011. Trophic downgrading of planet earth. Science 333:301-306.

FAA (Federal Aviation Administration). 2005. Aviation and emissions – A primer. Federal Aviation Administration, Office of Environment and Energy, Washington, D.C., USA.

Fancy, S. G. 1982. Reaction of bison to aerial surveys in interior Alaska. Canadian Field Naturalist 96:91.

Ferris, D. H. and R. D. Andrews. 1967. Parameters of a natural focus of *Leptospira pomona* in skunks and opossums. Bulletin of the Wildlife Disease Association 3:2-10.

FHWA (Federal Highway Administration). Highway Statistics 2010. Office of Highway Policy Information, Federal Highway Administration. Table VM-1. Retrieved from http://www.fhwa.dot.gov/policyinformation/statistics/2010/vm1.cfm

Fichter, E., and R. Williams. 1967. Distribution and status of the red fox in Idaho. Journal of Mammalogy 48:219-230.

Forthman-Quick, D. L., C. R. Gustavson, and K. W. Rusiniak. 1985*a*. Coyote control and taste aversion. Appetite 6:253-264.

Forthman-Quick, D. L., C. R. Gustavson, and K. W. Rusiniak. 1985*b*. Coyotes and taste aversion: the authors' reply. Appetite 6:284-290.

Frank, D. A. 2008. Evidence for top predator control of a grazing ecosystem. Oikos 117:1718-1724.

Frank, M. 2011 Colorado hikers and bikers under attack from sheep dogs. Adventure Journal October 17, 2011.

Fraser, D., J. F. Gardner, G. B. Kolenosky, and S. M. Strathearn. 1982. Estimation of harvest rate of black bears from age and sex data. Wildlife Society Bulletin 10:53-57.

Frenzel, R. W., and R. G. Anthony. 1989. Relationship of diets and environmental contaminants in wintering bald eagles. Journal of Wildlife Management 53:792-802.

Fritzell, E. K. 1987. Gray Fox and Island Gray Fox. Pages 408-420 *in* M. Novak, J. A. Baker, M. E. Aboard, B. Ballock, editors. Wild Furbearer Management and Conservation in North America. Ministry of Natural Resources, Ontario, Canada. 1150 pp.

Fuller, W. A. 1969. Changes in number of three species of small rodents near Great Slave Lake, Northwest Territories, Canada, 1964-1967 and their significance for general population theory. Annales Zoologici Fennici 6:113-144.

Gantz, G. 1990. Seasonal movement pattern of coyotes in the Bear River Mountains of Utah and Idaho. Thesis, Utah State University, Logan, Utah, USA.

GAO (General Accounting Office). 1990. Wildlife management: Effects of animal damage control program on predators. U. S. Government Accounting Office Report to the Honorable Alan Cranston, U.S. Senate. GAO/RCED-90-149, 31 pp.

GAO. 2001. Wildlife services program: Information on activities to manage wildlife damage. Report to Congressional Committees. GAO-02-138. United States General Accounting Office, Washington, D.C., USA.

Garner, G. W. 1976. Mortality of white-tailed deer fawns in the Wichita Mountains, Comanche County, Oklahoma. Ph.D. Thesis. Oklahoma State University, Stillwater, Oklahoma, USA.

Garner, G. W., J. A. Morrison, and J. C. Lewis. 1976. Mortality of white-tailed deer fawns in the Wichita Mountains, Oklahoma. Proceedings from the Annual Conference Southeastern Association of Fish and Wildlife Agencies 13:493-506

Garrettson, P. R., and F. C. Rowher. 2001. Effects of mammalian predator removal on production of upland-nesting ducks in North Dakota. Journal of Wildlife Management 65:398-405.

Gazda, R., and J. Connelly. 1993. Ducks and predators: more ducks with fewer trees? Idaho Wildlife 13:8-10.

Gebhardt, K. S. A. Shwiff, B. R. Leland, D. R. Hatchett, M. J. Bodenchuk. 2009. Methodology to estimate cost savings associated with use of trap monitor systems by Wildlife Services. Proceedings of the Wildlife Damage Management Conference 13:132-136.

Gehrt, S. T. 2003. Raccoons (Procyon lotor and Allies). Pages 611-634 *in* G. A. Feldhamer, B. C. Thompson, and J. A Chapman editors. Wild mammals of North America. John Hopkins University Press, Baltimore, Maryland, USA.

George, K. A., K. M. Slagle, R. S. Wilson, S. J. Moeller, and J. T. Bruskotter. 2016. Changes in attitudes towards animals in the United States from 1978-2014. Biological Conservation 201:237-242.

Gerwolls, M. K., and S. M. Labott. 1994. Adjustment to the death of a companion animal. Anthrozoos 7:172-187.

Gese, E. M. 1998. Response of neighboring coyotes (*Canis latrans*) to social disruption in an adjacent pack. Canadian Journal of Zoology 76:1960-1963.

Gese, E. M. 1999. Threat of predation: do ungulates behave aggressively towards different members of a coyote pack? Canadian Journal of Zoology 77:499-503.

Gese, E. M. 2005. Demographic and spatial responses of coyotes to changes in food and exploitation. Proceedings of the Wildlife Damage Conference 11:271-285.

Gese, E. M., and S. Grothe. 1995. Analysis of coyote predation on deer and elk during winter in Yellowstone National Park, Wyoming. American Midland Naturalist 133:36-43.

Gese E. M. and F. F. Knowlton. 2001. The role of predation in wildlife population dynamics. Pages 7-25 *in* E. F. Ginnett and S. E. Henke, editors. The role of predator control as a tool in game management. Texas Agricultural Research and Extension Center. San Angelo, Texas, USA.

Gese, E. M., O. J. Rongstad, and W. R. Mytton. 1988. Home range and habitat use of coyotes in southeastern Colorado. Journal of Wildlife Management 52:640-646.

Gese, E. M., O. J. Rongstad, and W. R. Mytton. 1989. Population dynamics of coyotes in southeastern Colorado. Journal of Wildlife Management 53:174-181.

Gese, E. M., R. L. Ruff, and R. L. Crabtree. 1996*a*. Social and nutritional factors influencing the dispersal of resident coyotes. Animal Behaviour 52:1025-1043.

Gese, E. M., R. L. Ruff, and R. L. Crabtree. 1996*b*. Foraging ecology of coyotes (*Canis latrans*): the influence of extrinsic factors and a dominance hierarchy. Canadian Journal of Zoology 74:769-783.

Gese, E. M., and P. A. Terletzky. 2009. Estimating coyote numbers across Wyoming: a geospatial and demographic approach. Report prepared for Wyoming Department of Agriculture Animal Damage Management Board. USDA, Animal and Plant Health Inspection Service, Wildlife Services, National Wildlife Research Center, Logan, UT.

Gier, J. T. 1968. Coyotes of Kansas. Kansas Agricultural Experiment Station Bulletin 393, Kansas State University, Manhattan, Kansas, USA.

Gill, J. L., J. W. Williams, S. T. Jackson, K. B. Lininger and G. S Robinson. 2009. Pleisotcene megafaunal collapse, novel plant communities and enhanced fire regimes in North America. Science 326:1100-1103.

Gill, R. B. 1999. Declining mule deer populations in Colorado: reasons and responses. Special Report No. 77. Colorado Division of Wildlife. DOW-R-S-77-01. 30 pp.

Gillette, G. L. 2014. Ecology of Columbian sharp-tailed grouse in southern Idaho: evaluating infrared technology, in Conservation Reserve Program, statistical population reconstruction, and olfactory concealment theory. Dissertation. University of Idaho, Moscow, USA.

Giri, S. N., D. H. Gribble, and S. A. Peoples. 1976. Distribution and binding of radioactivity in the starling after intravenous administration of (14C) 3-chloro-p-toluidine. Experimental and Molecular Pathology 24:392-404.

Goldade, D. A., J. D. Tessari, and J. J. Johnston. 2004 - Absorption, distribution and excretion of DRC-1339 in two species of birds following a single oral dose. Journal of Agricultural and Food Chemistry. 52, 8074-8080.

Good, E. E. 1952. The life history of the American crow *Corvus brachyrhyncos brehm*. Ph.D. Thesis, Ohio State University, Columbus, Ohio, USA.

Good, R. E., R. M. Nielson, H. Sawyer, and L. L. McDonald. 2007. A population estimate for Golden Eagles in the western United States. Journal of Wildlife Management 71 (2):395-402.

Goodwin, D. 1986. Crows of the world. British Museum of Natural History. Cornell University Press, Ithaca, New York, USA.

Gottstein, B. 1992. Molecular and immunological diagnosis of Echinococcosis. Clinical Microbiology Review 5:248-261.

Graber, D. M. 1981. Ecology and management of black bears in Yosemite National Park. Ph.D. Thesis, University of California, Berkeley, California, USA.

Gregg, M. A. 1991. Use and selection of nesting habitat by sage-grouse in Oregon. Thesis, Oregon State University, Corvallis, Oregon, USA.

Greenwood, R. J. 1986. Influence of striped skunk removal on upland duck nest success in North Dakota. Wildlife Society Bulletin 14:6-11.

Grubb, T. G., Delaney, D. K., Bowerman, W. W., and Wierda, M. R. 2010. Golden eagle indifference to heli-skiing and military helicopters in Northern Utah. Journal of Wildlife Management 74:1275-1285.

Gunderson, L. H. 2000. Ecological resilience – in theory and application. Annual Review of Ecology and Systematics 31:425-439.

Gustavson, C. R., J. R. Jowsey, and D. N. Milligan. 1982. A 3-year evaluation of taste aversion coyote control in Saskatchewan. Journal of Range Management 35:57-59.

Gustavson, C. R., J. Garcia, W. G. Hankins, and K. W. Rusiniak. 1974. Coyote predation control by aversive conditioning. Science 184:581-583.

Guthery, F. S., and S. L. Beasom. 1977. Responses of game and nongame wildlife to predator control in south Texas. Journal of Range Management 30:404-409.

Hagen, C. A. 2011. Predation on greater sage-grouse. Pages 95-100 *in* S. T. Knick and J. W. Connelly, editors. Greater Sage-Grouse: ecology and conservation of a landscape species and its habitats. Studies in Avian Biology, University of California Press, Berkeley, California, USA.

Haider, S., and K. Jax. 2007. The application of environmental ethics in biological conservation: a case study from the southernmost tip of the Americas. Biodiversity Conservation 16: 2559-2573.

Haig, S. M., J. D'Elia, C. Eagles-Smith, J. M. Fair, J. Gervais, G. Herring, J. W. Rivers, and J. H. Shulz. 2014. The persistent problem of lead poisoning in birds from ammunition and fishing tackle. Condor 116:408-428.

Hall, T. C. 1994. Magpies. Pages E-79-E-85 *in* S. E. Hyngstrom, R. M. Timm, and G. E. Larson, editors. Prevention and Control of Wildlife Damage. Cooperative Extension Service, University of Nebraska; Great Plains Agricultural Council, Wildlife Committee; United States Department of Agriculture, APHIS, Animal Damage Control [Wildlife Services], Washington D.C., USA.

Halloran, M. J., R. C. Kaiser, W. A Hubert. 2010. Yearling greater sage-grouse respone to energy development in Wyoming. Journal of Wildlife Management 74:65-72.

Hamlin, K. L., S. J. Riley, D. Pyrah, A. R. Dood, and R. J. Mackie. 1984. Relationships among mule deer fawn mortality, coyotes, and alternate prey species during summer. Journal of Wildlife Management 48:489-499.

Harmon, D. and J. Jarvis. 2011. The national landscape conservation system: A model for long-term conservation of significant landscapes. Bureau of Land Management, Washington, D.C., USA.

Harrington, J. L. and M. R. Conover. 2007. Does removing coyotes for livestock protection benefit free-ranging ungulates? Journal of Wildlife Management 71:1555-1560

Harris, S. 1977. Distribution, habitat utilization and age structure of a suburban fox (*Vulpes vulpes*) population. Mammal Rev. 7:25-39.

Harris, S. 1979. Age-related fertility and productivity in red fox, *Vulpes vulpes*, in suburban London. Journal of Zoology 187:195-199.

Harris, S. and J. Rayner. 1986. Urban fox (*Vulpes vulpes*) population estimates and habitat requirements in several British cities. Journal of Animal Ecology 55:575-591.

Hart, C. M., O. S. Lee, and J. B. Low. 1950. The sharp-tailed grouse in Utah. Utah Department of Fish and Game Publication 3, Salt Lake City, USA.

Hawthorne, D. W. 2004. The History of Federal and Cooperative Animal Damage Control. *Sheep & Goat Research Journal.* Paper 6. http://digitalcommons.unl.edu/icwdmsheepgoat/6

Hayes, D. J. 1993. Lead shot hazards to raptors from aerial hunting. USDA, APHIS, WS. Billings, Montana. Unpubl. Rpt. 14 pp.

Heinrich, B. 1988. Why do ravens fear their food? Condor 90:950-952.

Heinrich, B., and J. W. Pepper. 1998. Influence of competitors on caching behavior in the common raven, *Corvus corax*. Animal Behaviour 56:1083-1090.

Henke, S. E. 1992. Effect of coyote removal on the faunal community ecology of a short-grass prairie. Dissertation, Texas Tech University, Lubbock, USA.

Henke, S. E. 1995. Effects of coyote control on their prey: a review. Pages 35-40 *in* D. Rollins, C. Richardson, T. Blankenship, K. Canon and S. Henke, editors. Coyotes in the Southwest: a compendium of our knowledge. December 1995. Texas Agricultural Extension Service, Texas A&M University, San Angelo, Texas, USA.

Henke, S. E. and F. C. Bryant. 1999. Effects of coyote removal on the faunal community in western Texas. Journal of Wildlife Management 63(4):1066-1081.

Henne, D. R. 1975. Domestic sheep mortality on a western Montana ranch. Thesis, University of Montana, Missoula, USA.

Hoffman, C. O. and J. L. Gottschang. 1977. Numbers, distribution, and movements of a raccoon population in a suburban residential community. Journal of Mammalogy 58:623-636

Hoffman, R. W., K. A. Griffin, J. M. Knetter, M. A. Schroeder, A. D. Apa, J. D. Robinson, S. P. Espinsoa, T. J. Christiansen, R. D. Northrup, D. A. Budeau, and M. J. Chutter. 2015. Guidelines for the management of Columbian sharp-tailed grouse populations and their habitats. Sage and Columbian Sharp-tailed Grouse Technical Committee, Western Association of Fish and Wildlife Agencies, Cheyenne, Wyoming, USA.

Hoffman, R. W., and A. E. Thomas. 2007. Columbian sharp-tailed grouse (*Tympanuchus phasianellus colmubianus*): a technical conservation assessment. Species Conservation Project. U.S. Forest Service, Rocky Mountain Region. http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5181954.pdf. Accessed 17 June 2015.

Holle, D. G. 1977. Diet and general availability of prey of the coyote (*Canis latrans*) at the Wichita Mountains National Wildlife Refuge, Oklahoma. Thesis, Oklahoma State University, Stillwater, Oklahoma, USA.

Holloran, M. J. 1999. Sage-grouse (*Centrocercus urophasiansu*) seasonal habitat use near Casper, Wyoming. Thesis, University of Wyoming, Laramie, Wyoming, USA.

Holloran, M. J. 2005. Greater sage-grouse (*Centrocercus urophasianus*) population response to natural gas field development in western Wyoming. Dissertation in partial fulfillment of the requirements of Doctor of Philosophy. Department of Zoology and Physiology, University of Wyoming, Laramie, Wyoming, USA.

Holloran, M. J., and S. H. Anderson. 2003. Direct identification of northern sage-grouse, *Centrocercus urophasianus*, nest predators using remote sensing cameras. Canadian Field-Naturalist 117:308-310.

Horn, S. W. 1983. An evaluation of predatory suppression in coyotes using lithium chloride-induced illness. Journal of Wildlife Management 47:999-1009.

Hornocker, M.G. 1970. An analysis of mountain lion predation upon mule deer and elk in the Idaho primitive area. Wildlife Monographs 21.

Horstman, L. P., and J. R. Gunson. 1982. Black bear predation on livestock in Alberta. Wildlife Society Bulletin 10:34-39.

Houseknecht, C. R. 1971. Movements, activity patterns and denning habits of striped skunks (*Mephitis mephitis*) and exposure potential for disease. Dissertation, University of Minnesota, Minneapolis, Minnesota, USA.

Howard, V. W. Jr., and R. E. Shaw. 1978. Preliminary assessment of predator damage to the sheep industry in southeastern New Mexico. Research Report 356. Agricultural Experiment Station, New Mexico State University, Las Cruces, New Mexico, USA.

Howard, V. W. Jr., and T. W. Booth. 1981. Domestic sheep mortality in southeastern New Mexico. Bulletin 863. Agricultural Experiment Station, New Mexico State University, Las Cruces, New Mexico, USA.

Howard, W. E. 1986. Natural and animal welfare: both are misunderstood. Exposition Press of Florida, Incorporated, Pompano Beach, Florida, USA.

Howard, W. E., and R. E. Marsh. 1982. Spotted and hog-nosed skunks. Pages 664-673 *in* J. A. Chapman and G. A. Feldhamer, editors. Wild mammals of North America. John Hopkins University Press, Baltimore, Maryland, USA.

Howe, K. B. 2012. Selection for anthropogenic structures and vegetation characteristics by common ravens (*Corvus corax*) within a sagebrush-steppe ecosystem. M.S. Thesis, Idaho State University, Pocatello, Idaho, USA.

Howe, K. B. and P. S. Coates. 2015. Observations of territorial breeding common ravens caching eggs of greater sage-grouse. Journal of Fish and Wildlife Management. June 2015; Volume 6; Issue 1. 187-190.

Howe, K. B., P. S. Coates, and D. J. Delehanty. 2014. Selection of anthropogenic features and vegetation characteristics by nesting common ravens in the sagebrush ecosystem. Condor. 16(1):35-49.

Howell, R. G. 1982. The urban coyote problem in Los Angeles County. Proceedings from the Vertebrate Pest Conference 10:21-23.

HSDB (Hazardous Substance Data Bank) for Sodium Cyanide. National Library of medicine, Bethesda, MD, August 1991.

Hurley, M. A., J. W. Unsworth, P. Zager, M. Hefflewhite, E. O. Garton, D. M. Montomery, J. R. Skalski, and C. L. Maycock. 2011. Demographic response to mule deer to experimental reduction of coyotes and mountain lions in Southeastern Idaho. Wildlife Monographs 178:1-33.

Hyngstrom, Scott E., R. M. Timm and G. E. Larson (editors) 1994 - Prevention and Control of Wildlife Damage. University of Nebraska Cooperative Extension, Great Plains Agricultural Council and USDA/APHIS/ADC.

Idaho Bird Records Committee. 2007 Birds of Idaho field checklist. http://idahobirds.net/ID_Checklist.pdf

Idaho Sage-grouse Advisory Committee. 2006. Conservation plan for the greater sage-grouse in Idaho. July 2006. http://fishandgame.idaho.gov/public/wildlife/sagegrouse/.

Idaho Sage-grouse Advisory Committee Technical Assistance Team. 2013. Idaho sage-grouse local working groups: statewide annual report 2012. Available at: http://fishandgame.idaho.gov/public/wildlife/sageGrouse/?getPage=174

IDFG (Idaho Department of Fish and Game). 1998. Black bear management plan 1999-2010. Unpublished. Idaho Department of Fish and Game, Boise, USA.

IDFG. 2000. Policy for avian and mammalian predation management. Idaho Department of Fish and Game, Boise, Idaho, USA.

IDFG. 2002. Mountain lion management plan. Idaho Department of Fish and Game, Boise, ID.

IDFG. 2006. Memorandum of understanding between Idaho department of fish and game and Idaho state animal damage control board. Idaho Department of Fish and Game, Boise, Idaho, USA.

IDFG. 2008. Idaho mule deer management plan 2008-2017. Idaho Department of Fish and Game, Boise, ID. http://fishandgame.idaho.gov/public/wildlife/planMuleDeer.pdf.

IDFG. 2011*a*. Furbearer. Study III, Job 1, Project W-170-R-35, Progress Report, July 1, 2010 to June 30, 2011. Idaho Department of Fish and Game, Boise, Idaho, USA.

IDFG. 2011*b*. Black bear. Study I, Job 9, Project W-170-R-34, Progress Report, July 1, 2010 to June 30, 2011. Idaho Department of Fish and Game, Boise, Idaho, USA

IDFG. 2011*c*. Mountain lion. Study I, Job 8, July 1, 2010 to June 30, 2011. Idaho Department of Fish and Game, Boise, Idaho, USA.

IDFG. 2012*a*. Furbearer. Study III, Job 1, Surveys and Inventories 2012 Statewide Report, July 1, 2011 to June 30, 2012. Idaho Department of Fish and Game, Boise, Idaho, USA.

IDFG. 2012*b* Black bear. Study I, Job 9, Surveys and Inventories 2012 Statewide Report, July 1, 2011 to June 30, 2012. Idaho Department of Fish and Game, Boise, Idaho, USA.

IDFG. 2012*c*. Mountain lion. Study I, Job 8, Surveys and Inventories 2012 Statewide Report, July 1, 2011 to June 30, 2012. Idaho Department of Fish and Game, Boise, Idaho, USA.

IDFG. 2013*a*. Evaluation of common raven removal to benefit at-risk sage-grouse populations. Migratory Bird Scientific Collecting Permit Application, Idaho Department of Fish and Game Response to Question 2b. Idaho Department of Fish and Game, Boise, Idaho, USA.

IDFG. 2013*b*. Bighorn sheep. Study I, Job 4, 2013 Statewide Report, July 1, 2012 to June 30, 2013. Idaho Department of Fish and Game, Boise, Idaho, USA.

IDFG. 2013*c*. Mountain lion. Study I, Job 8, Surveys and Inventories 2013 Statewide Report, July 1, 2012 to June 30, 2013.

IDFG. 2014*a*. Understanding predation management in Idaho. Idaho Department of Fish and Game, Boise, Idaho, USA. (http://fishandgame.idaho.gov/public/wildlife/predationMgmtBrochure.pdf)

IDFG. 2014*b*. Furbearer. Study III, Job 1, 2014, Surveys and Inventories Statewide Report, July 1, 2013 to June 30, 2014. Idaho Department of Fish and Game, Boise, Idaho, USA.

IDFG. 2014*c*. Upland Game, Furbearer & Turkey 2014 and 2015 Season and Rules. Idaho Department of Fish and Game, Boise, Idaho, USA.

IDFG. 2015*a*. Management plan for the conservation of Columbian sharp-tailed grouse in Idaho. Idaho Department of Fish and Game, Boise, Idaho. https://idfg.idaho.gov/sites/default/files/columbian-sharp-tailed-grouse-management-plan-2015-2025.pdf

IDFG. 2015*b*. Roadkill & wildlife salvage. Idaho Department of Fish and Game, Boise, Idaho, USA (https:fishandgame.idaho.gov/species/roadkill, accessed 17 March 2015).

IDFG. 2016. Depredation Program Review. Presented to the Idaho Wildlife Commission March 10, 2016. IDFG. Boise ID.

IGBST (Interagency Grizzly Bear Study Team). 2013. Response of Yellowstone grizzly bears to changes in food resources: A synthesis. Report to the Interagency Grizzly Bear Committee and Yellowstone Ecosystem Subcommittee. Interagency Grizzly Bear Study Team, U.S. Geological Survey, Northern Rocky Mountains Science Center, Bozeman, Montana, USA.

Iossa, G., C. D. Soulsbury, and S. Harris. 2007. Mammal trapping: a review of animal welfare standards of killing and restraining traps. Animal Welfare 2007, 16: 335-352. ISSN 0962-7286.

ISADCB (Idaho State Animal Damage Control Board). 2011*a*. Memorandum of understanding between Idaho state animal damage control board and United States department of agriculture animal and plant health inspection service wildlife services. [Available by contacting Idaho Wildlife Services, 9134 W. Blackeagle Drive, Boise, Idaho, 83709.]

ISADCB. 2011*b*. Report of private aerial hunting activity authorized by the Idaho state animal damage control board, 2011 [data from state fiscal year 2011]. . Idaho State Animal Damage Control Board, Idaho State Department of Agriculture, Boise, Idaho, USA.

ISADCB. 2012. Report of private aerial hunting activity authorized by the Idaho state animal damage control board, 2012[data from state fiscal year 2012]. . Idaho State Animal Damage Control Board, Idaho State Department of Agriculture, Boise, Idaho, USA.

ISADCB. 2013. Report of private aerial hunting activity authorized by the Idaho state animal damage control board, 2013 [data from state fiscal year 2013]. Idaho State Animal Damage Control Board, Idaho State Department of Agriculture, Boise, Idaho, USA.

ISADCB. 2014. Report of private aerial hunting activity authorized by the Idaho state animal damage control board, 2014 [data from state fiscal year 2014]. Idaho State Animal Damage Control Board, Idaho State Department of Agriculture, Boise, Idaho, USA.

ISADCB and WS. 2011. Memorandum of understanding between Idaho State Animal Damage Control Board and USDA, APHIS, Wildlife Services [-Idaho]. Copy is available from: USDA, APHIS, Wildlife Services, Boise, Idaho.

ISO (International Organization for Standardization). 1999. Animal (mammal) traps – Part 5: Methods for testing restraining traps; Annex C (informative) Trauma. International Standard Organization. ISO 10990-5:1999E.

James, P. C., and N. A. M. Verbeek. 1983. The food storage behavior of the north-western crow. Behaviour 85:276-291.

Johnson, D. H., A. B. Sargeant, and R. J. Greenwood. 1988. Importance of individual species of predators on nesting success of ducks in the Canadian Prairie Pothole region. Canadian Journal of Zoology 67:291-297.

Johnson, E. L. 1984. Applications to use sodium fluoroacetate (Compound 1080) to control predators; final decision. Fed. Reg. 49(27):4830-4836.

Johnson, G. D. and M. D. Strickland. 1992. Mountain lion compendium and an evaluation of mountain lion management in Wyoming. Western EcoSystems Technology, Inc., 1406 S. Greeley Hwy., Cheyenne, Wyoming, USA.

Johnson, R. J. 1994. American crows. Pages E-33 to E-40 *in* S. E. Hyngstrom, R. M. Timm, and G. E. Larson, editors. Prevention and Control of Wildlife Damage. University of Nebraska Cooperative Extension Service, University of Nebraska-Lincoln, Nebraska, USA.

Johnston, D. W. 1961. The biosystematics of American crows. University of Washington Press, Seattle, Washington, USA. pp 12-59.

Jones, H. W., Jr. 1939. Winter studies of skunks in Pennsylvania. Journal of Mammal. 20: 254-256.

Jones, P. V., Jr. 1949. Antelope management. Coyote predation on antelope fawns: main factor in limiting increase of pronghorns in the upper and lower plains areas in Texas. Texas Game and Fish 7:4-5, 18-20.

Jonker, S. A., J. F. Organ, R. M. Muth, R. R. Zwick, and W. F. Siemer. 2009. Stakeholder norms toward beaver management in Massachusetts. Journal of Wildlife Management 73:1158-1165.

Kahn, R., L. Fox, P. Horner, B. Giddings, and C. Roy. 1997. Conservation assessment and conservation strategy for swift fox in the United States. Swift Fox Conservation Team.

Kamil, A. C., R. P. Balda, D. J. Olson, and S. Good. 1993. Returns to emptied cache sites by Clark's nutcrackers, *Nucifraga columbiana*: a puzzle revisited. Animal Behaviour 45:421- 252.

Kamler, J. F., R. M. Lee, J. C. deVos Jr., W. B. Ballard, and H. A. Whitlaw. 2002. Survival and cougar predation of translocated bighorn sheep in Arizona. Journal of Wildlife Management 66:1267-1272.

Kasworm, W. F., H. Carriles, T. G. Radandt, M. Proctor, and C. Servheen. 2010. Cabinet-Yaak grizzly bear recovery area 2009 research and monitoring progress report. U.S. Fish and Wildlife Service, Missoula, Montana, USA.

Kasworm, W., K. Kendall, K. Boyd, A. Macleod, J. Boulanger, K. Annis, and M. Proctor. 2014. Grizzly bear abundance and density in Cabinet-Yaak ecosystem preliminary results: Mar 2014 (PowerPoint presentation). USGS, Northern Rocky Mountain Science Center. (http://www.wildlrockiesalliance.org/news/2014/0301grizzlyfoiaUSGS.pdf accessed 3 June 2015).

Keister, G. P., and M. J. Willis. 1986. Habitat selection and success of sage-grouse hens while nesting and brooding. Progress report. Pitman-Robertson Project W-87-R-2. Oregon Department of Fish and Wildlife, Portland, Oregon, USA.

Keith, L. B. 1961. A study of waterfowl ecology on small impoundments in southeastern Alberta. Wildlife Monographs 6.

Keith, L. B. 1974. Some features of population dynamics in mammals. International Congress on Game Biology 11:17-59.

Kellert, S. R. 1980. American's attitudes and knowledge of animals. North American Wildlife Conference 45:111-124.

Kellert, S. R. 1985. Public perception of predators, particularly the wolf and coyote. Biological Conservation 31:167-189.

Kellert, S. R. 1994. Public attitudes towards bears and their conservation. International Conference on Bear Research and Management. Bears their Biology, Behavior, and Management 9:43-50.

Kellert, S. and C. Smith. 2000. Human values toward large mammals. Pages 38-63 *in* S. Demarais and P. Krausman, editors. Ecology and Management of Large Mammals in North America. Prentice Hall, New Jersey, USA.

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

Kennelly, J. J., and B. E. Johns. 1976. The estrous cycle of coyotes. Journal of Wildlife Management 40:272-277.

Kilham, F. L. 1985. Territorial behavior of American crows. Wilson Bulletin 97:389-390.

Knick, S. 1990. Ecology of bobcats relative to exploitation and prey base decline in southeast Idaho. Wildlife Monographs 108.

Knick, S. T and J. W. Connelly. 2011. Greater Sage-Grouse: ecology and conservation of a landscape species and its habitats. Studies in Avian Biology, University of California Press, Berkeley, California, USA.

Knight, R. L. and M. W. Call. 1981. The common raven. U. S. Bureau of Land Management. Technical Note. No. 344. 62 pp

Knittle, C. E., E. W. Schafer, Jr., and K. A. Fagerstone, 1990. Status of compound DRC-1339 registrations. Proceedings of the Vertebrate Pest Conference 14:311–313.

Knopf, F. L., and B. A. Knopf. 1983. Flocking pattern of foraging American crows in Oklahoma. Wilson Bulletin 96:153-155.

Knowlton, F. F. 1964. Aspects of coyote predation in south Texas with special reference to white-tailed deer. Dissertation, Purdue University, Lafayette, Illinois, USA.

Knowlton, F. F. 1972. Preliminary interpretation of coyote population mechanics with some management implications. Journal of Wildlife Management 36:369-382.

Knowlton, F. F., and L.C. Stoddart. 1983. Coyote population mechanics: another look. Pages 83-111 *in* F. L. Bunnell, D. S. Eastman, and J. M. Peek, editors. Symposium on Natural Regulation of Wildlife Populations. Forest, Wildlife, and Range Experiment Station, University of Idaho, Moscow, Idaho, USA.

Knowlton, F. F., and L. C. Stoddart. 1992. Some observations from two coyote-prey studies. Pages 101-121 *in* A. H. Boer, editor. Ecology and Management of the Eastern Coyote. University of New Brunswick, Fredericton, New Brunswick, Canada.

Knowlton, F. F., and E. M. Gese. 1995. Coyote population processes revisited. Pages 1-6 *in* D. Rollins, C. Richardson, T. Blankenship, K. Canon, and S. Henke, editors. Coyotes in the southwest: a compendium of our knowledge. Texas Parks and Wildlife Department, Austin, Texas, USA.

Knowlton, F. F., E. M. Gese, and M. M. Jaeger. 1999. Coyote depredation control: an interface between biology and management. Journal of Range Management 52:398-412.

Kochert, M. N., K. Steenhof, C. L. McIntyre, and E. H. Craig. 2002. Golden Eagle (*Aquila chrysaetos*). No. 684, *in* The Birds of North America Online. A. Poole, ed. Acad. Nat. Sci., Phil., Cornell Lab of Ornithology and the American Ornithologists' Union.

Koehler, G. 1987. The Bobcat. Pages 399-409 *in* R. L. Silvestro, editor. Audubon Wildlife Report. The National Audubon Society, New York, New York, USA.

Kohn, B. E. 1982. Status and management of black bears in Wisconsin. Wisconsin Department of Natural Resources Technical Bulletin, Volume 129. Wisconsin Department of Natural Resources, Madison, Wisconsin, USA.

Kolenosky, G. B., and S. M. Strathearn. 1987. Black bear. Pages 442-454 *in* M. Novak, J. A. Baker, M. E. Obbard, B. Mallock, editors. Wild Furbearer Management and Conservation in North America. Ministry of Natural Resources, Ontario, Canada.

Krausman, P. R., and J. J. Hervert. 1983. Mountain sheep responses to aerial surveys. Wildlife Society Bulletin 11:372-375.

Krausman, P. R., B. D. Leopold, and D. L. Scarbrough. 1986. Desert mule deer response to aircraft. Wildlife Society Bulletin 14:68-70.

Krausman, P. R., A. V. Sandoval, and R. C. Etchberger. 1999. Natural history of desert bighorn sheep. Pages 139-191 *in* R. Valdez and P. R. Krausman, editors. Mountain sheep of North American, University of Arizona, Tucson, Arizona, USA.

Krebs, C. J., R. Boonstra, S. Boutin and A. R. E. Sinclair. 2001. What drives the 10-year cycle of snowshoe hares? Bioscience 51:25-35.

Kreeger, T. J., P. J. White, U. S. Seal, and J. R. Tester. 1990. Pathological Responses of Red Foxes to Foothold Traps. Journal of Wildlife Management 54(1):147-160.

Kristin, W. B., and W. I. Boarman. 2003. Spatial patterns of risk of common raven predation on desert tortoises. Ecology 84:2432-2443.

Knopf F. L., and B. A. Knopf. 1983. Flocking pattern of foraging American crows in Oklahoma. Wilson Bulletin 95:153-154.

Kushlan, J.A. 1979. Effects of helicopter censuses on wading bird colonies. Journal of Wildlife Management 43:756-760.

Laidlaw, M. A., H. W. Mielke, G. M. Filippelli, D. L. Johnson, and C. R. Gonzales. 2005. Seasonality and Children's Blood Lead Levels: Developing a Predictive Model Using Climatic Variables and Blood Lead Data from Indianapolis, Indiana, Syracuse, New York, and New Orleans, Louisiana (USA). Environmental Health Perspectives 113:793-800.

Laliberte, A. S. and W. J. Ripple. 2004. Range Contractions of North American Carnivores and Ungulates. BioScience, February 2004/Vol. 54, No. 2: 123-138.

Lambert, C. M. S., R. B. Wielgus, H. S. Robinson, D. D. Katnik, H. S. Cruickshank, R. Clarke, and J. Almack. 2006. Cougar Population Dynamics and Viability in the Pacific Northwest. Journal of Wildlife Management 70(1):246-254.

Lariviere, S. 1999. Reasons why predators cannot be inferred from nest remains. Condor 101:718-721.

Larsen, K. H., and J. H. Dietrich. 1970. Reduction of a raven population on lambing grounds with DRC- 1339. Journal of Wildlife Management 34:200-204.

Larson, S. 2006. The Marin County predator management program: Will it save the sheep industry? Proceedings of the Vertebrate Pest Conference 22:294-297.

Laundré, J. W., L. Hernández, and S. G. Clark. 2007. Numerical and demographic responses of pumas to changes in prey abundance: testing current predictions. Journal of Wildlife Management 71:345-355.

LeCount, A. 1977. Causes of fawn mortality. Final Report, Federal Aid to Wildlife Restoration Project W-78-R, WP-2, J-11, Arizona Game and Fish Department, Phoenix, Arizona, USA.

Lefrançois, G. R. 1999. The Lifespan. Sixth edition. Wadsworth Publishing Company, Belmont, California.

Levi, T and C. C. Wilmers. 2012. Wolves-coyotes-foxes: a cascade among carnivores. Ecology 93:921-929.

Lindzey, F. G. 1971. Ecology of badgers in Curlew Valley, Utah and Idaho with emphasis on movements and activity patterns. M.S. Thesis. Utah State University, Logan, Utah, USA.

Lindzey, F. C. 1978. Movement patterns of badgers in northwestern Utah. Journal of Wildlife Management 42:418-422.

Lindzey, F. G. 1982. Badger. Pages 653-663 *in* J. A. Chapman and G. A. Feldhamer, editors. Wild mammals of North America. The Johns Hopkins University Press, Baltimore, Maryland, USA.

Lindzey, F. G. 2003. Badger (*Taxidea taxus*). Pages 683-691 in G. A. Feldhamer, B. C. Thompson, and J. A Chapman editors. Wild mammals of North America. The Johns Hopkins University Press, Baltimore, Maryland, USA.

Linhart, S. B. 1983. Managing coyote damage problems with nonlethal techniques: recent advances in research. Proceeding of the Eastern Wildlife Damage Control Conference 1:105-118.

Linhart, S. B., G. J. Dasch, R. R Johnson, J. D. Roberts, and C. J. Packham. 1992. Electronic frightening devices for reducing coyote predation on domestic sheep: Efficacy under range conditions and operational use. Vertebrate Pest Conference 15: 386-392.

Link, W. A., and J. R. Sauer. 1994. Estimating equations estimates of trend. Bird Populations 2:23-32.

Linz, G. M., C. E. Knittle and R. E. Johnson. 1992. Home range of breeding common ravens in coastal southern California. Southwest Naturalist 37:199-202.

Linz, G. M., C. E. Knittle, and R. E. Johnson. 1990. Ecology of corvids in the vicinity of the Aliso Creek California least tern colony, Camp Pendleton, California. USDA, APHIS, Denver Wildlife Research Center, Bird Section Research Report No. 450.

Littin, K. E., D. J. Mellor, B. Warburton and C. T. Eason. 2004. Animal welfare and ethical issues relevant to the humane control of vertebrate pests. New Zealand Veterinary Journal 52(1):1-10.

Littin, K. E. and D. J. Mellor. 2005. Strategic animal welfare issues: ethical and animal welfare issues arising from the killing of wildlife for disease control and environmental reasons. Scientific and Technical Review of the Office International des Epizooties 24(2): 767-782.

Litvaitis, J. A. 1978. Movements and habitat use of coyotes on the Wichita Mountains National Wildlife Refuge. M. S. Thesis. Oklahoma State University, Stillwater, Oklahoma, USA.

Litvaitis, J. A., and J. H. Shaw. 1980. Coyote movements, habitat use, and food habits in Southwestern Oklahoma. Journal of Wildlife Management 44:62-68.

Lockyer, Z. B., D. J. Delehanty, P. S. Coates, M. L. Casazza, and S. Espinoza. 2013. Greater sage-grouse nest predators in the Virginia Mountains of northwestern Nevada. Journal of Fish and Wildlife Management 4:242-254.

Logan, K. A., L. L. Sweanor, T. K. Ruth, and M. G. Hornocker. 1996. Cougars of the San Andres Mountains, New Mexico. Final Report. Federal Aid Wildlife Restoration Project W-128-R. New Mexico Department of Game and Fish, Santa Fe, New Mexico, USA.

Loomis, J. 2012. Fuzzy Math: Wildlife Services should improve its economic analysis of predator control. Natural Resources Defense Council Issue Paper. IP12-05-A. https://www.nrdc.org/sites/default/files/fuzzy-math-IP.pdf.

Luoma, J. R. 1997. Catfight. Audubon 99: 85-90.

Lynch, G. M. 1972. Effect of strychnine control on nest predators of dabbling ducks. Journal of Wildlife Management 36:436-440.

MacDonald, D. W. and M. T. Newdick. 1982. The distribution and ecology of foxes. *Vulpes vulpes* (L.) in urban areas. *In* R. Bornkamm, J. A. Lee, and M. R. D. Seaward eds. Urban Ecology. Blackwell Sci. Publ., Oxford, UK. pp. 123-135.

Mace, R. and J. S. Waller. 1998. Demography and population trend of grizzly bears in the Swan Mountain, Montana. Conservation Biology 12:1005-1016.

Mace R. D., and T. Chilton-Radandt. 2011. Black bear harvest research & management in Montana 2011 final report. Federal Aid *in* Wildlife Restoration Project W-154-R, Montana Fish, Wildlife and Parks, Wildlife Division, Helena, Montana, USA.

MacIvor, L. H., S. C. Melvin, and C. R. Griffin. 1990. Effects of research activity on piping plover nest predation. Journal of Wildlife Management. 54:443-447.

Mackie, Richard J., D. F. Pac, K. L. Hamlin, and G. L. Dusek 1998. Ecology and Management of Mule Deer and White-tailed Deer in Montana. Federal Aid Project W-120-R. Montana Fish, Wildlife and Parks, Wildlife Division, Helena, Montana, USA.

MacPherson, D. 2005. Bullet penetration: modeling the dynamics and the incapacitation resulting from wound trauma. Ballistic Publications, El Segundo, California, USA.

Manfredo, M. J., C. L. Pierce, D. Fulton, J. Pate, and B. R. Gill. 1999. Public acceptance of wildlife trapping in Colorado. Wildlife Society Bulletin 27:499-508.

Manzer, D. L., and S. J. Hannon. 2005 Relating grouse nest success and corvid density to habitat: A multi-scale approach. Journal of Wildlife Management 69:110-123.

Marks, C. A. 2010. Haematological and biochemical responses of red foxes (Vulpes vulpes) to different capturing methods and shooting. Animal Welfare 19-223-234.

Marks, J. S., and V. Saab Marks. 1987. Habitat selection by Columbian sharp-tailed grouse in west-central Idaho. U.S. Department of the Interior, Bureau of Land Management, Boise, Idaho, USA.

Marlow, M. 2016. No laughing matter: Livestock protection dogs conserve predators too. The Wildlife Professional 10:26-29.

Maron, J. L. and D. E. Pearson. 2011. Vertebrate predators have minimal cascading effects on plant production or seed predation in an intact grassland ecosystem. Ecology letters 7:661-669.

Marzluff, J. M., R. B. Boone, and G. W. Cox. 1994. Native pest bird species in the West: why have they succeeded where so many have failed? Studies in Avian Biology 15:202-220.

Marzluff, J. M., K. J. McGowan, R. Donnelly, and R. L. Knight. 2001. Causes and consequences of expanding American crow populations. Pages 331-363 *in* J. M Marzluff, R. Bowman, and R. Donnelly, editors. Avian ecology and conservation in an urbanizing world. Kluwer Academic Press, Norwell, Massachusetts, USA.

Mattson, D. J., and C. Jonkel. 1990. Stone pines and bears. In: W.C. Schmidt and K.J. McDonald (compilers). Proceedings - symposium on whitebark pine ecosystems: ecology and management of a high-mountain resource. FUSFS General Technical Report INT-270. As cited in: Mattson, D.J., and D.P. Reinhart. 1994. Relationships among red squirrels, whitebark pine, and pine seed use by Yellowstone grizzly bears. National Biological Survey, University of Idaho, Moscow, Idaho, USA.

Mattson, D. J., K. C. Kendall, and D. P. Reinhart. 2001. Whitebark pine, grizzly bears, and red squirrels. *In* D.F. Tomback, S.F. Arno, and R.E. Keane, editors. Whitebark Pine Communities: Ecology and Restoration. Island Press, Washington, D.C., USA.

Mayo Clinic. 2011. Acute kidney Failure. http://www.mayoclinic.com/health/kidney-failure/DS00280/METHOD=print.

Maycock, C., and G. Graves. 2001. Aversive conditioning of black-billed magpies through the use of Mesurol on the Sterling Wildlife Management area, March, 2001. Unpublished Report. USDA, APHIS, Wildlife Services, Boise, Idaho, USA.

McCord, C. M., and J. E. Cardoza. 1982. Bobcat and lynx. Pages 728-766 *in* J. A. Chapman and G. A. Feldhamer, editors. Wild Mammals of North America: biology, management, and economics. Johns Hopkins University Press, Baltimore, Maryland, USA.

McDonald, M. W. 1998. Ecology of Columbian sharp-tailed grouse in eastern Washington. Thesis, University of Idaho, Moscow, USA.

McKay, B. D., and R. M. Zink. 2010. The causes of mitochrondrial DNA gene tree paraphyly in birds. Molecualr Phylogenetics and Evolution 54:647-650.

McKinney, T., S. R. Boe, and J. C. deVos Jr. 2003. GIS-based evaluation of escape terrain and desert bighorn sheep populations in Arizona. Wildlife Society Bulletin 31:1229-1236.

McKinney, T., J. C. deVos Jr., W. B. Ballard, and S. R. Boe. 2006. Mountain lion predation of translocated desert bighorn sheep in Arizona. Wildlife Society Bulletin 34: 1255-1263.

McManus, D. P. L. Zhang, L. J. Casrodale, T. H. Le, M. Phearson, and D. Blair. 2002. Short report: Molecular genetic characterization of an unusually severe case of hydatid disease in Alaska caused by the cervid strain of *Echinococcus granulosus*. American Journal of Tropical Medicine and Hygiene 67:296-298.

Meints, D. R. 1991. Seasonal movements, habitat use, and productivity of Columbian sharp-tailed grouse in southeastern Idaho. Thesis, University of Idaho, Moscow, USA.

Melillo, Jerry M., Terese (T.C.) Richmond, and Gary W. Yohe, Eds., 2014: *Climate Change Impacts in the United States: The Third National Climate Assessment*. U.S. Global Change Research Program, U.S. Government Printing Office, Washington, D.C. 841 pp. doi:10.7930/J0Z31WJ2.

Meltzer, H., L. Lovacs, T. Oxford, and M. Matas. 1956. Echinococcosis in North American Indians and Eskimos. Canadian Medical Association Journal 75:121-138.

Messick, J. P., and M. G. Hornocker. 1981. Ecology of the badger in southwestern Idaho. Wildlife Monographs 76.

Messier, F. and C. Barrette. 1982. The social system of the coyote (Canis latrans) in a forested habitat. Canadian Journal of Zoology 60:1743-1753.

Messmer, T. A., M. W. Brunson, D. Reiter, and D. G. Hewitt. 1999. United States public attitudes regarding predators and their management to enhance avian recruitment. Wildlife Society Bulletin 27:75-85.

Meyers, B. 2000. Anticipatory mourning and the human-animal bond. Pages 537-564 *in* T. A. Rando, ed. Clinical dimensions of anticipatory mourning: theory and practice in working with the dying, their loved ones, and their caregivers. Research Press, Champaign, Illinois.

Mezquida, E. T., S. J. Slater and C. W. Benkman. 2006. Sage-grouse and indirect interactions: potential implications of coyote control on sage-grouse populations. Condor 108:747-759.

Michener, G. R. 2005. Limits on egg predation by Richardson's ground squirrels. Canadian Journal of Zoology 83:1030-1037.

Miller, B., B. Dugelby, D. Foreman, C. Martínez del Río, R. Noss, M. Phillips, R. Reading, M. E. Soulé, J. Terborgh, and L. Willcox. 2001. The importance of large carnivores to healthy ecosystems. Endangered Species UPDATE, 18: 202–209.

Miller, B. J., H. J. Harlow, T. S. Harlow, D. Biggins and W. J. Ripple. 2012. Trophic cascades linking wolves (*Canis lupus*), coyotes (*Canis latrans*) and small mammals. Canadian Journal of Zoology 90:70-78.

Mills, L. S., and F. F. Knowlton. 1991. Coyote space use in relation to prey abundance. Canadian Journal of Zoology 69:1516-1521.

MIS (Management Information System). 2011. Idaho Wildlife Services 2011 program data reports. USDA, APHIS, Wildlife Services, Boise, Idaho, USA.

MIS. 2012. Idaho Wildlife Services 2012 program data reports. USDA, APHIS, Wildlife Services, Boise, Idaho, USA.

MIS. 2013. Idaho Wildlife Services 2013 program data reports. USDA, APHIS, Wildlife Services, Boise, Idaho, USA.

MIS. 2014. Idaho Wildlife Services 2014 program data reports. USDA, APHIS, Wildlife Services, Boise, Idaho, USA.

MIS. 2015. Idaho Wildlife Services 2015 MIS activity reports. USDA, APHIS, Wildlife Services, Boise, Idaho, USA.

MIS. 2016. Idaho Wildlife Services Rec/CEM data report. USDA, APHIS, Wildlife Services, Boise, Idaho, USA.

Mourits, M. C. M., M. A. P. M. van Asseldonk, R. B. M. Huirne. 2010. Multi criteria decision making to evaluate control strategies of contagious animal diseases. Preventive Veterinary Medicine 96: 201-210.

Mull, R. L. 1971. Comparative studies of acute and subacute toxicity of 3-chloro-p-toluidine, studies of the effects of an acutely toxic dose in chickens on certain clinical biochemical parameters, and comparative studies of a renal aromatic N-deacylase. Ph.D. dissertation. University of California, Davis, California, USA.

Muñoz, J. R. 1977. Cause of sheep mortality at the Cook Ranch, Florence, Montana. 1975-1976. Thesis, University of Montana, Missoula, Montana, USA.

Muñoz-Igualada, J., J. A. Shivik, F. G. Domínguez, J. Lara, and L. M. González. 2008. Evaluation of cage-traps and cable restraint devices to capture red foxes in Spain. Journal of Wildlife Management 72:830-836.

Musiani, M., C. Mamo, L. Boitani, C. Callaghan, C. C. Gates, L. Mattei, E. Visalberghi, S. Breck and G. Volpi. 2003. Wolf depredation trends and the use of fladry barriers to protect livestock in western North America. Conservation Biology 17:1538-1547.

Myers, J. H., and C. J. Krebs. 1971. Genetic, behavioral, and reproductive attributes of dispersing field voles *Microtus pennsylvanicus* and *Microtus ochrogaster*. Ecological Monographs 41:53-78.

Mysterud, I. 1977. Bear management and sheep husbandry in Norway, with discussion of predatory behavior significant foe evaluation of livestock losses. International Conference Bear Research 4:233-241.

Nadeau, S. 2008. Idaho mountain lion status report. Pages 10 – 17 *in* Toweill D. E., S. Nadeau, and D. Smith, editors. Proceedings of the Ninth Mountain Lion Workshop, May 5-8, 2008, Sun Valley, Idaho, USA.

Nadeau, S. 2014. Furbearer Report. Idaho Department of Fish and Game, Boise, ID.

Naiman, R. J. and K. H. Rogers. 1997. Large animals and system-level characteristics in river corridors: implication for river management. Bioscience 47:521-529.

Nass, R. D. 1977. Mortality associated with range sheep operations in Idaho. Journal of Range Management 30:253-258

Nass, R. D. 1980. Efficacy of predator damage control programs. Proceedings of the Vertebrate Pest Conference 9:205-208.

NASS (National Agricultural Statistics Service). 2010. Sheep and goats death loss. National Agricultural Statistics Service, Agricultural Statistics Board, U.S. Department of Agriculture, Washington D.C., USA.

NASS. 2011. Cattle death loss. National Agricultural Statistics Service, Agricultural Statistics Board, U.S. Department of Agriculture, Washington D.C., USA.

NASS. 2013. 2013 Idaho agricultural statistics. United States Department of Agriculture, National Agricultural Statistics Service, Idaho Field Office, Boise, Idaho, USA.

NASS. 2016a. 2014 State Agriculture Overview – Idaho. United States Department of Agriculture, National Agricultural Statistics Service, Quick Stats. Accessed February 19, 2016. http://www.nass.usda.gov/Quick_Stats/Ag_Overview/stateOverview.php?state-IDAHO.

NASS. 2016*b*. Statement of Commitment to Scientific Integrity by Principal Statistical Agencies. Accessed August 19, 2016. https://www.nass.usda.gov/About_NASS/ScientificIntegrityStatement.pdf

Nassar, R., and J. Mosier. 1991. Projections of pet populations from census demographic data. Journal of Veterinary Medical Association 198:1157-l159.

National Audubon Society. 1977. The Audubon Society field guide to North American birds, western region. Chanticleer Press, Inc., New York, New York, USA.

NatureServe Explorer. 2015. Ground squirrel species accounts. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://explorer.natureserve.org. (Accessed: June 18, 2015).

Naughton-Treves, L., R. Grossberg, and A. Treves. 2003. Paying for tolerance: rural citizens attitudes toward wolf depredation and compensation. Conservation Biology 17:1500-1511.

Navarro-Sigüenza, A. G. and A. T. Peterson. 2004. An alternative species taxonomy of the birds of Mexico. Biota Neotropica 4(2) http://www.biotaneotropica.org.br/v4n2/pt/abstract?taxonomic-review+BN03504022004.

Neal, D. L. 1990. The effect of predation on deer in the central Sierra Nevada. Pages 53-61 *in* G. A. Giusti, R. M. Timm, and R. H. Schmidt, editors. Proceedings of predator management in California. University of California, Hopland Field Station Publication 101, California, USA.

Neff, D. J., and N. G. Woolsey. 1979. Effect of predation by coyotes on antelope fawn survival on Anderson Mesa. Arizona Game and Fish Department, Special Report Number 8, Phoenix, Arizona, USA.

Neff, D. J., and N. G. Woolsey. 1980. Coyote predation on neonatal fawns on Anderson Mesa, Arizona. Proceedings Biennial Pronghorn Antelope Workshop 9:80-97.

Neff, D. J., R.H. Smith, and N.G. Woolsey. 1985. Pronghorn antelope mortality study. Final Report, Federal Aid to Wildlife Restoration Project W-78-R, Arizona Game and Fish Department, Phoenix, Arizona, USA.

Nelson, A. L. 1934. Some early summer food preferences of the American Raven in southeastern Oregon. Condor 36:10-15.

Newsome, T. M. and W. J. Ripple. 2014. A continental scale trophic cascade from wolves through coyotes to foxes. Journal of Animal Ecology 84:49-59.

Newsome, T. M. J. A. Dellinger, C. R. Pavey, W. J. Ripple, C. R. Shores, A. J. Wirsing and C. R. Dickman. The ecological effects of providing resource subsidies to predators. Global Ecology and Biogeography 24:1-11.

Nielsen, L. 1988. Definitions, considerations, and guidelines for translocation of wild animals. Pp 12-49 *in* L. Nielsen and R. D. Brown, editors. Translocation of wild animals. Wisconsin Humane Society, Milwaukee, Wisconsin, and Caesar Kleberg Wildlife Research Institute, Kingsville, Texas.

Novak, M. 1987. Traps and trap research. Pages 941-969 in M. Novak, J. A. Baker, M. E. Obbard, and B. Mallock, editors. Wild furbearer management and conservation in North America. Ministry of Natural Resources, Ontario, Canada.

NPS (National Park Service). 1995. Report of effects of aircraft overflights on the National Park System. USDI-NPS D-1062, July, 1995.

NPS. 2015*a*. Craters of the moon national monument and preserve. History & Culture. National Park Service. http://www.nps.gov/crmo/learn/historyculture/index.htm Accessed 1 May 2015.

NPS. 2015*b*. National park service, national trails system, general information. National Park Service. http://www.nps.gov/nts/nts_faq.html Accessed 30 April 2015.

Nunley, G. L. 1977. The effects of coyote control operations on non-target species in New Mexico. Great Plains Wildlife Damage Workshop 3:88-110.

Nyhus, P., H Fischer, F Madden, and S. Osofsky. 2003. Taking the bite out of wildlife damage – the challenges of wildlife compensation schemes. Conservation in Practice 4:37-40.

ODFW (Oregon Department of Fish and Wildlife). 2006. Oregon cougar management plan. Oregon Department of Fish and Wildlife, Salem, Oregon, USA.

O'Gara, B. W., K. C. Brawley, J. R. Munoz, and D. R. Henne. 1983. Predation on domestic sheep on a western Montana ranch. Wildlife Society Bulletin 11:253-264.

OIG (Office of Inspector General). 2015. APHIS Wildlife Services – Wildlife Damage Management. USDA Office of Inspector General Report 33601-0002-41. https://www.usda.gov/oig/webdocs/33601-0002-41.pdf

Olendorff, R. R. 1993. Status, biology, and management of ferruginous hawks: a review. Raptor Res. and Tech. Asst. Cen., Spec. Rep. U.S. Dep. Interior, Bur. Land Manage., Boise, Id. 84pp.

Olsen, G. H., S. B. Linhart, R. A. Holmes, G. J. Dasch, and C. B. Male. 1986. Injuries to coyotes caught in padded and unpadded steel foothold traps. Wildlife Society Bulletin 14:219–223.

Omland, K. E., C. L. Tarr, W. I. Boarman, J. M. Barzluff, and R. C. Fleisher. 2000. Cryptic genetic variation and paraphyly in ravens. Proceedings of the Royal Society of London 267:2475-2482.

Onderka, D. K., D. L. Skinner, and A. W. Todd. 1990. Injuries to coyotes and other species caused by four models of footholding devices. Wildl. Soc. Bull. 16:175-182.

Osborne, S. and R. Lindsey. 2013. 2012 State of the Climate: Earth's Surface Temperature. NOAA. Online. https://www.climate.gov/news-features/understanding-climate/2012-state-climate-earths- surface-temperature. Accessed 10 June 2015.

Ozoga, J. J. and E. M. Harger. 1966. Winter activities and feeding habits of northern Michigan coyotes. Journal of Wildlife Management 30:809-818.

Painter, L. E., R. L. Beschta, E. J. Larsen, and W. J. Ripple. 2014. After long-term decline, are aspen recovering in northern Yellowstone? Forest Ecology and Management 329:108-117.

Palmer, B. C., M. R. Conover, and S. N. Frey. 2010. Replication of a 1970s study on domestic sheep losses to predators on Utah's summer rangelands. Rangeland Ecology and Management 63:689-695.

Palmore, W. P. 1978. Diagnosis of toxic acute renal failures in cats. Florida Veterinary Journal 14:14- 15, 36-37.

Parker, H. 1984. Effect of corvid removal on reproduction of willow ptarmigan and black grouse. Journal of Wildlife Management 48:1197-1205.

Partners in Flight Science Committee. 2013. Handbook to the partners in flight population estimates database, Version 2.0. Partners in Flight Technical Series No 6. http://www.partnersinflight.org/pubs/ts/.

Partners in Flight Science Committee. 2015. PIF population estimates database. http://rmbol.org/v3/avian/Databases.aspx (accessed 20 April, 2015).

Pattee, O. H., S. N. Wiemeyer, B.M. Mulhern, L. Sileo, and J. W. Carpenter. 1981. Experimental lead-shot poisoning in bald eagles. Journal of Wildlife Management 45:806-810.

Patterson, R. L. 1952. The sage-grouse in Wyoming. Sage Books, Denver, Colorado, USA. Pearson, E. W. 1986. A literature review of livestock losses to predators in western U.S. Denver Wildlife Research Center, Building 16, Denver Federal Center, Denver, Colorado, USA.

Peebles, K. A., R. B. Wielgus, B. T. Maletzke, and M. E. Swanson. 2013. Effects of Remedial Sport Hunting on Cougar Complaints and Livestock Depredations. PLoS ONE 8(11): e79713. doi:10.1371/journal.pone.0079713

Perry, D., and G. Perry. 2008. Improving interactions between animal rights groups and conservation biologists. Conservation Biology 22(1):27-35.

PIF (Partners in Flight) and RMBO (Rocky Mountain Bird Observatory). 2004. Landbird population estimates database. Partners in Flight and Rocky Mountain Bird Observatory, Brighton, Colorado, USA <www.rmbo.org/pifpopestimates/Database.aspx>.

Phillips, R. L. 1970. Age ratio of Iowa foxes. Journal of Wildlife Management 34:52-56.

Phillips, R. L. 1996. Evaluation of 3 types of snares for capturing coyotes. Wildlife Society Bulletin 24: 107-110.

Phillips, R. L., and L. D. Mech. 1970. Homing behavior of a red fox. Journal of Mammalogy 51:621.

Pietz, P. J., and D. A. Granfors. 2000. Identifying predators and fates of grassland passerine nests using miniature video cameras. Journal of Wildlife Management 64:71-87.

Pils, C. M. and M. A. Martin. 1978. Population dynamics, predator-prey relationships and management of the red fox in Wisconsin. Wisconsin Department of Natural Resources, Technical Bulletin 105.

Pimentel, D., S. McNair, J. Janecka, J. Wrightman, C. Simmonds, C. O'Connel, E. Wong, L. Russel, J. Zern, T. Aquino, and T. Tsomondo. 2000. Economic and environmental threats of alien plant, animal, and microbe invasion. Agriculture, Ecosystems and Environment 84:1-20.

Pimlott, D. H. 1970. Predation and productivity of game populations in North America. Transactions of the International Congress on Game Biology 9:63-73.

Pitelka, F. A. 1957. Some characteristics of microtine cycles in the artic. Oregon State College, Biological Colloquium Proceedings 18:73-88.

Pitman, J. C., C. A. Hagen, B. E. Jamison, R. J. Robel, T. M. Loughin, and R. D. Applegate. 2006. Nesting ecology of lesser prairie-chicken nests in sand sagebrush prairie of southwestern Kansas. The Wilson Journal of Ornithology 118:23-35.

Pitt, W. C., F. F. Knowlton, and P. W. Box. 2001. A new approach to understanding canid populations using an individual-based computer model: preliminary results. Endangered Species Update 18:103-106.

Pitt, W. C., P. W. Box, and F. F. Knowlton. 2003. An individual-based model of canid populations: modeling territoriality and social structure. Ecological Modeling 166:109-121.

Pohle, H. 1920. Die unterfamilie der lutrinae. Arch Naturgesch. Jahrg. 85, 1919, abt. A., vol. 9 pp. 1-247.

Pojar, T. M. and D. C. Bowden. 2004. Neonatal mule deer fawn survival in West-Central Colorado. Journal of Wildlife Management 68:550-560.

Poudyal, N. N. Baral and S. T. Asah. 2016. Wolf lethal control and livestock depredations: counter-evidence from respecified models. PlosOne 11(2): e0148743. doi:10.1371/journal.pone.0148743

Powell, R. A. and G. Proulx. 2003. Trapping and marking terrestrial mammals for research: integrating ethics, performance criteria, techniques, and common sense. Institute for Laboratory Animal Research Journal, Volume 44, Number 4: 259-276.

Presnall, C. C., and A. Wood. 1953. Coyote predation on sage-grouse. Journal of Mammalogy 34:127.

Proctor, M. F., Paetkau, D., Mclellan, B. N., Stenhouse, G. B., Kendall, K. C., Mace, R. D., Kasworm, W. F., Servheen, C., Lausen, C. L., Gibeau, M. L., Wakkinen, W. L., Haroldson, M. A., Mowat, G., Apps, C. D., Ciarniello, L. M., Barclay, R. M. R., Boyce, M. S., Schwartz, C. C. and Strobeck, C. 2012. Population fragmentation and inter-ecosystem movements of grizzly bears in western Canada and the northern United States. Wildlife Monographs, 180: 1–46. doi: 10.1002/wmon.6

Proulx, G. and M. W. Barrett. 1990. Assessment of Power Snares to Effectively Kill Red Fox. Wildlife Society Bulletin 18(1):27-30.

Proulx, G. and M. W. Barrett. 1993. Field testing the C120 magnum trap for mink. Wildlife Society Bulletin 21:421-426.

Prugh, L. R., C. J. Stoner, C. W. Epps, W. T. Bean, W. J. Ripple, A. S. Laliberte, and J. S. Brashares. 2009. The rise of the mesopredator. BioScience 59:779-791.

Pyrah, D. 1984. Social distribution and population estimates of coyotes in north-central Montana. Journal of Wildlife Management 48:679-690.

Ramey, C. A. and E. W. J. Schafer. 1996. The evolution of APHIS two gas cartridges. Proceedings of the 17th Vertebrate Pest Conference, University of California, Davis.

Rashford, B. S., T. Foulk, and D. T. Taylor. 2010. Ranch-level economic impacts of predation in a range livestock system. Society for Range Management, June 2010, pp. 21-26.

Rausch, R. L. 2003. Cystic echinococcosis in the Artic and Sub-Artic. Parasitology 127:S73-S85.

Rich, T. D., C. J. Beardmore, H. Berlanga, P. J. Blancher, M. S. W. Bradstreet, G. S. Butcher, D. W. Demarest, E. H. Dunn, W. C. Hunter, E. E. Inigo-Elias, J. a. Kennedy, A. M. Martell, A. O. Panjabi, D. N. Pashley, K. V. Rosenberg, C. M. Rustay, J. S. Wendt, and T. C. Will. 2004. Partners in flight North American landbird conservation plan. Cornell Lab of Ornithology, Ithaca, New York, USA.

Richards, G. L. 1971. The common crow, *Corvus brachyrhynchos*, in the great basin. Condor 73:116-118.

Ripple, W. J., and R. L. Beschta. 2012. Large predators limit herbivore densities in northern forest ecosystems. European Journal of Wildlife Research, DOI 10.1007/s10344-012-0623-5.

Ripple, W. J., and R. L. Beschta. 2006. Linking a cougar decline, trophic cascade and catastrophic regime shift in Zion National Park. Biological Conservation 133:397-408.

Ripple, W. J., and R. L. Beschta. 2008. Trophic cascades involving cougar, mule deer and black oaks in Yosemite National Park. Biological Conservation 141:1249-1256.

Ripple, W. J., R. J. Beschta, J. K. Fortin, and C. T. Robbins. 2013a. Trophic cascades from wolves to grizzly bears in Yellowstone. Journal of Animal Ecology doi: 10.1111/1365-2656.12123.

Ripple, W. J., A. J. Wirsing, C. C. Wilmersn and M. Letnic. 2013b. Widespread mesopredator release after wolf extirpation. Biological Conservation 160:70-79.

Ripple, W. J., T. R. Rooney and R. L. Beschta. 2010. Large predators, deer, and trophic cascades in Boreal and Temperate ecosystems. Pages 141-171 *in* J. Terborgh and J. A. Estes, eds. Trophic Cascades: Predators, Prey and the Changing Dynamics of Nature. Island Press, Washinton.

Ritchie, E. G., and C. N. Johnson. 2009. Predator interactions, mesopredator release and biodiversity conservation. Ecology Letters 12:982-998.

Riter, W. E. 1941. Predator control and wildlife management. Transactions of the North American Wildlife Conference 6:294-299.

Rivest, P. and J. M. Bergerson. 1981. Density, food habits, and economic importance of raccoons (*Procyon lotor*) in Quebec agrosystems. Canadian journal of Zoolology 59:1755-1762.

Roberts, H. B. 1992. Birds of east central Idaho. Northwest Printing, Boise, Idaho, USA.

Robinette, W.L., J. S. Gashwiler, and O. W. Morris. 1961. Notes on cougar productivity and life history. Journal of Mammalogy 42:204-217.

Robinette, W. L., N.V. Hancock, and D.A. Jones. 1977. The Oak Creek mule deer herd in Utah. Utah Division of Wildlife Resource Publication 77-15, Salt lake City, USA.

Robinson, W. B. 1961. Population changes of carnivores in some coyote-controlled areas. Journal of Mammalogy 42:510-515.

Robinson, J. D., and T. A. Messmer. 2013. Vitals rates and seasonal movements of two isolated greater sage-grouse populations in Utah's west desert. Human-Wildlife Interactions 7:182-194.

Rogers, L. L. 1976. Effect of mast and berry crop failures on survival, growth, and reproductive success of black bear. Transactions of the North American Wildlife and Natural Resources Conference, Volume 41:431-438.

Rohwer, F. C., P. R. Garrettson, and B. J. Mense. 1995. Can predator trapping improve waterfowl recruitment in the Prairie Pothole region? Proceedings of the Eastern Wildlife Damage Management Conference 7:12-22.

Rolley, R. E. 1985. Dynamics of a harvested bobcat population in Oklahoma. Journal of Wildlife Management 49:283-292.

Rominger, E. M, and M. E. Weisenberger. 1999. Biological extinction and a test of the "conspicuous individual hypothesis" in the San Andres Mountain, New Mexico. North American Wild Sheep Conference 2:293-309.

Rominger, E. M., H. A. Whitlaw, D. L. Weybright, W. C. Dunn, and W. B. Ballard. 2004. The influence of mountain lion predation on bighorn sheep translocations. Journal of Wildlife Management 68:993-999.

Rosatte, R. C. 1987. Striped, spotted, hooded and hog-nosed skunks. Pages 599-613 *in* M. Novak, J. A. Baker, M. E. Obbard and B. Malloch, editors. Wild Furbearer Management and Conservation in North America. Ministry of Natural Resources, Ontario, Canada.

Rosatte, R. C. and J. R. Gunson. 1984. Dispersal and home range of striped skunks, *Mephitis mephitis*, in an area of population reduction in southern Alberta. Canadian Field Naturalist 98:315-319.

Rowlands, I. W., and A. S. Parkes. 1935. The reproductive processes of certain mammals VIII. Reproduction in foxes (*Vulpes* spp.). Proc. Zool. Soc. London: 823-841.

Rowley, G. J. and D. Rowley. 1987. Decoying coyotes with dogs. Proceedings of the Eighth Great Plains Wildlife Damage Control Workshop 8:179-181.

Roy, L. D., and M. J. Dorrance. 1985. Coyote movements, habitat use, and vulnerability in central Alberta. Journal of Wildlife Management 49:307-313.

Royall, W. C., T. J. DeCino, and J. F. Besser. 1967. Reduction of a starling population at a turkey farm. Oxford Journals 1494-1495.

Sacks, B. N. 1996. Ecology and behavior of coyotes in relation to depredation and control on a California sheep ranch. Thesis, University of California, Berkeley, California, USA.

Sacks, B. N., K. M. Blejwas, and M. M. Jaeger. 1999. Relative vulnerability of coyotes to removal methods on a northern California sheep ranch. Journal of Wildlife Management 63:939-949.

Sacks, B. N., M. M. Jaeger, J. C. C.Neale, and D. R. McCullough. 1999. Territoriality and breeding status of coyotes relative t sheep predation. Journal of Wildlife Management 63:593-605.

Salmon, T. P., A. C. Crabb, and R. E. Marsh. 1986. Bird damage to pistachios. California Agriculture 40:5-8.

Sanderson, G. C. 1987. Raccoon. Pages 486-499 *in* M. Novak, J. A. Baker, M. E. Obbard, and B. Mallock, editors. Wild furbearer management and conservation in North America. Ministry of Natural Resources, Ontario, Canada.

Sarasola, J. H., J. I. Zanón-Martinez, A. S. Costán, and W. J. Ripple. 2016. Hypercarnivorous apex predators could provide ecosystem services by dispersing seeds. Scientific Reports 6:19647 | DOI: 10.1038/srep19647

Sargeant, A. B. 1972. Red fox spatial characteristics in relation to waterfowl predation. Journal of Wildlife Management 36:225-236.

Sargeant, A. B. 1978. Red fox prey demands and implications to prairie duck production. Journal of Wildlife Management 42:520-527.

Sargeant, A. B., S. H. Allen, and R. T. Eberhardt. 1984. Red fox predation on breeding ducks in midcontinent North America. Wildlife Monographs 89.

Sargeant, A. B., S. H. Allen, and J. O. Hastings. 1987. Spatial relationships between sympatric coyotes and red foxes in North Dakota. Journal of Wildlife Management 51:285-293.

Sauer, J. R., J. E. Hines, J. E. Fallon, K. L. Pardieck, D. J. Ziolkowski, Jr., and W. A. Link. 2014. The North American breeding bird survey, results and analysis 1966 - 2013. Version 01.30.2015, Updated 30 January 2015. USGS Patuxent Wildlife Research Center, Laurel, Maryland, USA. (http://www.mbr-pwrc.usgs.gov/bbs/bbs.html, accessed 13 April, 2015)

Schafer, E. W. Jr. 1981. Bird control chemicals-nature, mode of action, and toxicity. Pages 129-139 *in* D. Pimentel, editor. CRC Handbook of Pest Management in Agriculture, Volume III, CRC Press, Boca Raton, Florida, USA.

Schafer, E. W. 1984. Potential primary and secondary hazards of avicides. Proceedings of the Vertebrate Pest Conference 11:217-222.

Schafer, E. W., Jr., W. A. Bowles, Jr., and J. Hurlbut. 1983. The acute oral toxicity, repellency and hazard potential of 998 chemicals to one or more species of wildlife and domestic birds. Arch. Environmental Contaminates Toxicology 12:355-382.

Schafer 1990a. Letter from Edward Schafer, U.S. Departmetn of AGricultre to Yvonne Brown, U.S.Enviornmetnal Protection Agency dated February 28, 1990, Phase 2 Response – Lict C Case #3806, Chemical #74002 – Inorganic cyanide waiver request (Low Volume – Miror Use) Revised Commitment Page.

Schafer 1990b. Letter to Fran Ribis re: Phase 2 response – List B, Case #2610, Chemical #9901 – starlicide waiver request (Low Volume – Minor Use).

Schafer 1991. Bird control Chemicals – nature, modes of action and toxicity. CRC Handbook of Pest Mangement in Agriculture, Vol. II. D. Pimentel (ed.) pp 599-610.

Schafer, J. M., R. D. Andrews, and J. J. Dimsmore. 1981. An assessment of coyote and dog predation on sheep in southern Iowa. Journal of Wildlife Management 45:883-893.

Schafer, E. W., Jr. 1991. Bird control chemicals-nature, modes of action, and toxicity. Pages 599-610 in D. Pimentel, ed. CRC Handbook of Pest Management in Agriculture, Vol. II.

Schmidt, R. H. 1989. Vertebrate pest control and animal welfare. Pages 63-68 *in* K. A. Fagerstone and R. D. Curnow, editors. Vertebrate Pest Control and Management. Materials. 6th Vol., ASTM STP 1055, American Society of Materials and Testing, Philadelphia, Pennsylvania, USA.

Schmidt, R. H. 1992. Why bad things happen to good animals. Proceedings of the Vertebrate Pest Conference 15:25-28.

Schobert, E. 1987. Telazol® use in wild and exotic animals. Veterinary Medicine. October 1080-1088.

Schroeder, M. A., and R. K. Baydack. 2001. Predation and the management of prairie grouse. Wildlife Society Bulletin 29:24-32.

Schroeder, M. A., J. R. Young and C. E. Braun. 1999. Greater sage-grouse (*Centrocercus urophasianus*). The Birds of North America Online (A. Poole, Editor.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/425doi:10.2173/bna.425

Schroeder, M.A., M. Atamain, K. Thorburn, M. Finch, J. Anderson, and D. Stinson. 2014. Re-introduction of greater sage-grouse to Lincoln County, Washington: Progress Report. Washington Department of Fish and Wildlife. 28 pp.

Schwab R. G., M. J. Cummings, and M. E. Campney. 1964. Overt toxic properties of DRC-1339. Pages 16-17 *in* R. G. Schwab, editor. Starling control research in California. Progress report for 1964. University of California, United States Department of the Interior, and California State Department of Agriculture, Sacramento, California, USA.

Schwartz, C. C., M. A. Haroldson, K. A. Gunther, and D. Moody. 2006. Distribution of grizzly bears in the Greater Yellowstone Ecosystem in 2004. Ursus 17:63-66.

Seidensticker, J. C., IV, M.G. Hornocker, W. V. Wiles, and J. P. Messick. 1973. Mountain lion social organization in the Idaho primitive area. Wildlife Monograph 35.

Seidler, R.G., and E.M. Gese. 2012. Territory fidelity, space use, and survival rates of wild coyotes following surgical sterilization. Journal of Ethology: 1-10.

Shaw, H.G. 1977. Impact of mountain lion on mule deer and cattle in northwestern Arizona. Proceedings Symposium Montana Forrest Conservation Experimental Station, Missoula, Montana, USA.

Shaw, H. G. 1981. Comparison of mountain lion predation on cattle on two study areas in Arizona. University of Idaho, Symposium of Wildlife Range Science 306-318.

Shaw, H. G. 1987. Mountain Lion Field Guide. Special Report Number 9. Arizona Game & Fish Department.

Sheldon, W. G. 1950. Denning habits and home range of red foxes in New York State. Journal of Wildlife Management 14:33-42.

Shelton, M. and J. Klindt. 1974. Interrelationship of coyote density and certain livestock and game species in Texas. Texas A&M University, Agricultural Experiment Station MP-1148, College Station, Texas, USA.

Sherman, M. W. 1993. Activity patterns and foraging ecology of nesting common ravens in the Mojave Desert, California. M.S. Thesis, Colorado State University, Fort Collins.

Shivik, J. A. 1995. Factors influencing space use and activity of Southern Basin coyotes. Thesis, University of California, Berkeley, California, USA.

Shivik, J. A., M. M. Jaeger, and R. H. Barret. 1996. Coyote movements in relation to spatial distribution of sheep. Journal of Wildlife Management 60:422-430.

Shivik, J. A., A. Treves, and P. Callahan. 2003. Nonlethal techniques for managing predation: primary and secondary repellents. Conservation Biology 17:1531-1537.

Shivik, J. A., D. J. Martin, M. J. Pipas, J. Turnan, and T. J. DeLiberto. 2005. Initial comparison: jabs, cables, and cage traps to capture coyotes. Wildlife Society Bulletin 33:1375-1383.

SHPO (State Historical and Preservation Office). 2014. Opinion letter from the Idaho State Historical Society/State Historic Preservation Office to George Graves indicating that predator damage management, as proposed by WS-Idaho, will have no effect on historic properties in Idaho. State Historic Preservation Office, Boise, Idaho, USA.

Shwiff, S. A., and R. J. Merrell. 2004. Coyote predation management: an economic analysis of increased antelope recruitment and cattle production in south central Wyoming. Sheep & Goat Research Journal 19:29-33.

Shwiff, S. A., R. T. Sterner, K. N. Kirkpatrick, R. M. Engeman, and C. C. Coolahan. 2005. Wildlife Services in California: Economic Assessments of Select Benefits and Costs. October 2005. USDA/APHIS/WS National Wildlife Research Center, 4101 LaPorte Avenue, Ft. Collins, CO 80521. October 2005. 35 pp.

Simpson, G. 1972. Some approaches to control depredations by crows and jays in Tulare County. Proceedings of the Vertebrate Pest Conference 5:112-117.

Slate, D. A., R. Owens, G. Connolly, and G. Simmons. 1992. Decision making for wildlife damage management. Transactions of the North American Wildlife Natural Resources Conference 57:51- 62.

Smith, R. H., and A. LeCount. 1979. Some factors affecting survival of desert mule deer fawns. Journal of Wildlife Management 43(3): 657-665.

Smith, R. H., D. J. Neff, and N. G. Woolsey. 1986. Pronghorn response to coyote control - A benefit:cost analysis. Wildlife Society Bulletin 14:226-231.

Smith, R. K., A. S. Pullin, G. B. Stewart, and W. J. Sutherland. 2010. Effectiveness of Predator Removal for Enhancing Bird Populations. Conservation Biology Volume 24, No 3, 820-829.

Sneddon, L. U., R. W. Elwood, S. A. Adamo, and M. C. Leach. 2014. Defining and assessing animal pain. Animal Behaviour 97 (2014) 201-212.

Sonenshine, D. E. and E. L. Winslow. 1972. Contrasts in distribution of raccoons in two Virginia localities. Journal Wildlife Management 36:838-847.

Spencer, J. O., Jr. 2002. DRC-1339 use and control of common ravens. Proceedings of the Vertebrate Conference 20:110-113.

Stahl, R. S., S J. Werner, J. L. Cummings, and J. J. Johnston. 2008. Computer simulations of baiting efficacy for raven management using DRC-1339 egg baits. Pages 94-97 *in* R. M. Timm and M. B. Madon, editors, Proceedings of the 23rd Vertebrate Pest Conference. University of California, Davis, California, USA.

Stansley, W., L. Widjeskog, and D. E. Roscoe. 1992. Lead Contamination and Mobility in Surface Water at Trap and Skeet Ranges. Bulletin of Environmental Contamination and Toxicology 49:640-647.

Stauber, E., N. Finch, P. A. Talcott, and J. M. Gay. 2010. Lead Poisoning of Bald (*Haliaeetus leucocephalus*) and Golden (*Aquila chrysaetos*) Eagles in the US Inland Pacific Northwest Region—An 18-year Retrospective Study: 1991–2008. Journal of Avian Medicine and Surgery 24:279-287.

Steele, J. L. Jr. 1969. An investigation of the Comanche County deer herd. Federal Aid in Fish and Wildlife Restoration Project W-87-R. Oklahoma Department of Wildlife Conservation, Oklahoma City, Oklahoma, USA.

Steele, J. R., B. S. Rashford, T. K. Foulke, J. A. Tanaka, and D. T. Taylor. 2013. Wolf (Canis lupus) predation impacts on livestock production: direct effects, indirect effects, and implications for compensation ratios. Rangeland Ecology and Management 66:539-544.

Steenhof, K., M. N. Kochert, and J. A. Roppe. 1993. Nesting by raptors and common ravens on electrical transmission line towers. Journal of Wildlife Management 57:271-281.

Sterner, R. T. 1995. Cue enhancement of lithium-chloride-inducted mutton/sheep aversions in coyotes. Pages 92-95 *in* R. E. Masters and J. G. Huggins, editors. Proceedings in the Twelfth Great Plains Wildlife Damage Control Workshop, Published by the Noble Foundation, Ardmore, Oklahoma, USA.

Sterner, R. T., and S. A. Shumake. 1978. Bait-induced prey aversion in predators: some methodological issues. Behavioral Biology 22:565-566.

Stevens, A. N. P. 2010. Dynamics of predation. Nature Education Knowledge 3 (10):46. http://www.nature.com/scitable/knowledge/library/dynamics-of-predation-13229468.

Stoddart, L. C. 1984. Relationships between prey base fluctuations and coyote depredation on sheep on the Idaho National Engineering Laboratory (INEL), 1979-1982. Unpublished Research Work Unit Report. Denver Wildlife Research Center 16 pp.

Stoddart, L. C., R. E. Griffiths, and F. F. Knowlton. 2001. Coyote responses to changing jackrabbit abundance affect sheep predation. Journal of Range Management 54:15-20.

Stokes, D. W., and L. Q. Stokes. 1996. Field guide to birds, western region. Little, Brown and Company, New York, New York, USA.

Storm, G. L. 1972. Daytime retreats and movements of skunks on farmlands in Illinois. Journal of Wildlife Management 36:31-45.

Storm, G. L. and M. W. Tzilkowski. 1982. Furbearer population dynamics: a local and regional management perspective. Pages 69-90 *in* G. C. Anderson, editor. Midwest Furbearer Management Proceedings Symposium 43rd Midwest Fish and Wildlife Conference, Wichita, Kansas, USA.

Storm, G. L., R. D. Andrews, R. L. Phillips, R. A. Bishop, D. B. Siniff, and J. R. Tester. 1976. Morphology, reproduction, dispersal, and mortality of midwestern red fox populations. Wildlife Monographs 49.

Stout, G. G. 1982. Effects of coyote reduction on white-tailed deer productivity on Fort Sill, Oklahoma. Wildlife Society Bulletin 10:329-332.

Streubel, D. 2000. Digital Atlas of Idaho. http://imnh.isu.edu/digitalatlas/index.htm#. Accessed 10/12/16.

Sugden, L. G., and G. W. Beyersbergen. 1986. Effect of density and concealment on American crow predation of simulated duck nests. Journal of Wildlife Management 50:9-14.

Sullivan, B. D., and J. J. Dinsmore. 1992. Home range and foraging habitat of American crows, *Corvus brachyrhynchos*, in a waterfowl breeding area in Manitoba. Canadian Field Naturalist 106:181-184.

Summers, R.W., R.E. Green, R. Proctor, D. Dugan, D. Lambie, R. Moncrieff, R. Moss, and D. Baines. 2004. An experimental study of the effects of predation on the breeding productivity of capercaillie and black grouse. Journal of Applied Ecology 41: 513–525.

Svenden, G. E. 1982. Weasels. Pages 613-628 *in* J. A. Chapman and G. A. Feldhamer, editors. Wild mammals of North America. The Johns Hopkins University Press, Baltimore, Maryland, USA.

Tabel, H., A. H. Corner, W. A. Webster, and C. A. Casey. 1974. History and epizootiology of rabies in Canada. Canadian Veterinary Journal 15:271-281.

Tawara, J. N., J. J. Johnston, and M. J. Goodall. 1996. Degradation of 3-chloro-p-toluidine hydrochloride in watermelon baits. Identification and chemical characterization of novel *N*-glucoside and oxopropanimine. Journal of Agriculture and Food Chemistry 44:3983-3988.

Taylor, R. L., B. L. Walker, D. E. Naugle, and S. S. Mills. 2012. Managing multiple vital rates to maximize greater sage-grouse population growth. Journal of Wildlife Management 76(2): 336-347.

Teel, T. L., R. S. Krannich, and R. H. Schmidt. 2002. Utah stakeholders' attitudes toward selected cougar and black bear management practices. Wildlife Society Bulletin 30(1)2–15.

Teel, T. L., M. J. Manfredo, and H. M. Stinchfield. 2007. The need and theoretical basis for exploring wildlife value orientations cross-culturally. Pages 297-305 in Human Dimensions of Wildlife.

Teer, J. G., D. L. Drawe, T. L. Blankenship, W. F. Andelt, R. S. Cook, J. Kie, F. F. Knowlton, and M. White. 1991. Deer and coyotes: The Welder Experiments. Transactions of the North American Wildlife and Natural Resources Conference 56:550-560.

Tigner, J. R., and G. E. Larson. 1977. Sheep losses on selected ranches in southern Wyoming. Journal of Range Management 30:244-252.

Till, J. A., and F. F. Knowlton. 1983. Efficacy of denning in alleviating coyote depredations upon domestic sheep. Journal of Wildlife Management 47:1018-1025.

Timm R. M. 1994. Starlicide®. Pages G-52 to G-53 *in* Prevention and Control of Wildlife Damage, Great Plains Agricultural Council and Nebraska Cooperative Extension Service, University of Nebraska, Lincoln, Nebraska, USA.

Timm, R. M., and R. H. Schmidt. 1989. Management problems encountered with livestock guarding dogs on the University of California, Hopland Field Station. Proceedings of the Great Plains Wildlife Damage Management Workshop. 9:54-58.

Todd, A. W. and L. B. Keith. 1976. Responses of coyotes to winter reductions in agricultural carrion. Alberta Recreation, Parks and Wildlife, Wildlife Technical Bulletin 5.

Todd, A. W., and L. B. Keith. 1983. Coyote demography during a snowshoe hare decline in Alberta. Journal of Wildlife Management 47:394-404.

Todd, A. W., L. B. Keith, and C. A. Fisher. 1981. Population ecology of coyotes during a fluctuation of snowshoe hares. Journal of Wildlife Management 45:629-640.

Toweill, D. E., and J. E. Tabor. 1982. River otter. Pages 688-703 *in* Wild Mammals of North America, J. A. Chapman and G. A. Feldhamer, editors. The Johns Hopkins University Press, Baltimore, Maryland, USA.

Trainer, C. E., J. C. Lemos, T. P. Kister, W. C. Lightfoot, and D. E. Toweill. 1981. Mortality of mule deer fawns in southeastern Oregon, 1968-1979. Oregon Department of Fish and Wildlife Resources Division Section Wildlife Research Report 10, Portland, Oregon, USA.

Treves, A., M. Krofel and J. McManus. 2016. Predator control should not be a shot in the dark. Frontiers in Ecology and the Environment 14:380-388.

Treves, A., L. Naughton-Treves, and V. Shelley. 2013. Longitudinal analysis of attitudes toward wolves. Conservation Biology 27:315-323.

Treves, A., R. B. Wallace and S. White. 2009. Participatory planning of interventions to mitigate human-wildlife conflicts. Conservation Biology 23:1577-1587.

Trost, Charles H. 1999. Black-billed magpie. No. 389 *in* The Birds of North America Online. A. Poole, ed. Acad. Nat. Sci., Phil., Cornell Lab of Ornithology and the American Ornithologists' Union.

Tucker, R. D., and G. W. Garner. 1980. Mortality of pronghorn antelope fawns in Brewster County, Texas. Proceedings Western Conference of Game and Fish Commission 60:620-631.

Tullar, B. F. Jr., L. T. Berchielli, Jr., and E. P. Saggese. 1976. Some implications of communal denning and pup adoption among red foxes in New York. New York Fish and Game Journal 23:93-95.

Turkowski, F. J., A. R. Armistead and S. B. Llinhart. 1984. Selectivity and effectiveness of pan tension devices for coyote foothold traps. Journal of Wildlife Management 48:700-708.

Twichell, A. R and H.H. Dill. 1949. One hundred raccoons from one hundred and two acres. Journal of Mammology 30:130-133.

TWS (The Wildlife Society). 2008. Sources and implications of lead ammunition and fishing tackle on natural resources. Technical Review 08-01, June 2008. The Wildlife Society, Bethesda, Maryland, USA.

UDWR (Utah Department of Natural Resources). 2002. Strategic management plan for Columbian sharp-tailed grouse 2002. State of Utah, Department of Natural Resources, Division of Wildlife Resources, Salt lake City, Utah, USA.

United States of America-European Union Community. (1997). Agreed minute and annex: standards for the humane trapping of specified terrestrial and semi-aquatic mammals. Brussels, Belgium.

Udy, J. R. 1953. Effects of predator control on antelope populations. Utah Department of Fish and Game. Publication Number 5, Salt Lake City, Utah, USA.

Urban, D. 1970. Raccoon populations, movement patterns, and predation on a managed waterfowl marsh. Journal of Wildlife Management 34:372-382.

USDA (U.S. Department of Agriculture). 1991. Economic assessment of the California cooperative animal damage control program 1980- 1990. USDA, APHIS, WS-California, Sacramento, California, USA.

USDA. 1996. Environmental assessment – Predator damage management in Northern and Central Idaho. U. S. Department of Agriculture, Animal and Plant Health Inspection Service, Animal Damage Control [Wildlife Services], Boise, Idaho, USA.

USDA. 1998. Environmental Assessment: Bird Damage Management in the Idaho Wildlife Services Program. U. S. Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Services, Boise, Idaho, USA.

USDA. 2001a. Research natural areas on national forest system lands in Idaho, Montana, Nevada, Utah, and western Wyoming: A guidebook for scientists, managers, and educators. United States Department of Agriculture, Forest Service, Rocky Mountain Research Station, General Technical Report RMRS-GTR-69, Fort Collins, Colorado, USA.

USDA. 2001b. Tech Note: DRC-1339 Starlicide. https://www.aphis.usda.gov/wildlife_damage/nwrc/publications/Tech_Notes/TN_DRC1339Starlicide.pdf

USDA. 2002*a*. Environmental assessment – Predator damage management in Southern Idaho. U. S. Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Services, Boise, Idaho, USA.

USDA. 2002*b*. Wildlife Services: Helping producers manage predation. Program Aid No. 1722. United States Department of Agriculture. Animal Plant Health Inspection Service, Wildlife Services, Riverdale, Maryland, USA.

USDA. 2003. Environmental Assessment: Bird damage management in the Idaho Wildlife Services Program - Amendment. U. S. Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Services, Boise, Idaho, USA.

USDA. 2004. Environmental Assessment: Rodent Damage Management in Idaho. U. S. Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Services, Boise, ID.

USDA. 2005. Final Environmental Assessment (EA): Predator Damage Management in Colorado. U. S. Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Services, Denver, Colorado, USA.

USDA. 2006. Environmental Assessment: Bird Damage Management in the Idaho Wildlife Services Program FY 2005 Monitoring Report and FY 2006 Amendment to the 1998 Environmental Assessment

USDA. 2011. Gray wolf damage management in Idaho. USDA, APHIS, Wildlife Services-Idaho, Boise, Idaho, USA.

USDA. 2013*a*. Biological assessment for wildlife damage management activities in Idaho – Analysis of potential impacts on threatened and endangered species. USDA, APHIS, Wildlife Services-Idaho, Boise, Idaho, USA.

USDA. 2013*b*. Predator damage management in the Canyon district of Texas. Texas Wildlife Services, San Antonio, Texas, USA.

USDA. 2016. Biological Assessment: wildlife damage management in Idaho by Wildlife Services. USDA, Animal and Plant Health Inspection Service, Wildlife Services, Boise, ID.

USFS (U.S. Forest Service). 1986. Interagency grizzly bear guidelines. United States Forest Service, Washington, D.C., USA. USFS. 1998. Final Environmental Impact Statement and Revised Land and Resource Management Plan-Routt National Forest, U.S. Dept. of Agriculture -USFS, 300+ pp.+ App A-l.

USFS. 2003. Caribou revised forest plan. http://www.fs.usda.gov/detail/ctnf/landmanagement/planning/?cid=stelprdb5228906

USFS. 2010. Boise National Forest amended forest plan. http://www.fs.usda.gov/detail/boise/landmanagement/planning/?cid=stelprdb5394192.

USFWS (U.S. Fish and Wildlife Service). 1973. Briefing data: Cyanide (HCN releasing compounds), economic justification for rodent control, Vol. II Denver, Colorado.

USFWS. 1975. Hazards to the environment: sodium cyanide, Unpublished Study, July 7, 1975, under 6704-75: CDL: 222125-E.

USFWS. 1978. Predator damage in the West: a study of coyote management alternatives. BLM-USFWS, Washington, D.C., USA.

USFWS. 1979. Mammalian predator damage management for livestock protection in the Western United States. Final Environmental Impact Statement. BLM-USFWS, Washington, D.C., USA.

USFWS. 1992. Formal consultation with the United States Department of Agriculture on its animal damage control (ADC) program. United States Fish and Wildlife Service, Washington, D.C., USA.

USFWS. 1993. Grizzly bear recovery plan. United States Fish and Wildlife Service, Missoula, Montana, USA.

USFWS. 1996*a*. Grizzly bear recovery plan – Supplement: Bitterroot ecosystem recovery plan chapter [updated 1996]. United States Fish and Wildlife Service, Missoula, Montana, USA. http://www.fws.gov/mountain-prairie/species/mammals/grizzly/BitterrootEcosystemSupplement1996.pdf Accessed 11 June 2015.

USFWS. 1996*b*. Biological assessment and informal consultation with the USFWS, Snake River Basin Office on predator damage management. Letter from Animal Damage Control to Mr. Robert Ruesink, Supervisor, Snake River Basin Office, Boise, Idaho, USA.

USFWS. 2000. Endangered and threatened wildlife and plants; 12-month finding for a petition to list the Columbian sharp-tailed grouse as threatened. Federal Register 65:60391-60396.

USFWS. 2002. Section 7 consultation for the Idaho Wildlife Services' predator damage management activities in 34 southern Idaho counties, File #140.0000, FWS # 1-4-02-F-0058, USFWS Snake River Basin Office, Boise, Idaho, USA.

USFWS. 2003. Recovery plan for the northern Idaho ground squirrel – (*Spermophilus brunneus brunneus*). Region 1, U. S. Fish and Wildlife Service, Portland, Oregon, USA.

USFWS. 2007. National bald eagle management guidelines. https://www.fws.gov/southdakotafieldoffice/NationalBaldEagleManagementGuidelines.pdf

USFWS. 2010. Endangered and threatened wildlife and plants; 12-month findings for petitions to list the greater sage-grouse (*Centrocercus urophasianus*) as threatened or endangered. Federal Register 75:13910-13958.

USFWS. 2011*a*. Northern Idaho ground squirrel, 5-year review: Summary and evaluation. U. S. Fish and Wildlife Service, Region 1, Idaho Fish and Wildlife Office, Boise, Idaho, USA.

USFWS. 2011*b*. Grizzly bear (*Ursus arctos horribilis*) 5-year review: Summary and evaluation. U. S. Fish and Wildlife Service, Grizzly Bear Recovery Office, Missoula, Montana, USA.

USFWS. 2012*a*. Grizzly bear recovery – Bitterroot ecosystem. U. S. Fish and Wildlife Service. http://www.fws.gov/mountain-prairie/es/grizzleBear.php Link site updated March 8, 2016.

USFWS. 2012*b*. Subpermit to take grizzly bears under certain condition as described in Section (i)(C) and (D) of the grizzly bear 4(d) rule, 50 CFR 17.40(b). Copy of subpermit can be obtained from WS-Idaho by calling Area Code (208) 373-1630 or by written request at the following address: USDA, APHIS, Wildlife Services, 9134 W. Blackeagle Dr., Boise, Idaho, 83709.

USFWS. 2012*c*. Permits for Non-Purposeful Take of Eagles: Fact Sheet. http://www.fws.gov/midwest/MidwestBird/EaglePermits/baeatakepermit.html.

USFWS. 2013. Biological opinion on the Idaho Panhandle National Forest plan revision, Chapter II – grizzly bear. Tracking number 01EIFW00-2013-F-0331. United States Fish and Wildlife Service, Northern Idaho Field Office, Spokane, Washington, USA.

USFWS. 2014. Biological and conference opinion for the wildlife damage management activities in the State of Idaho, wildlife services. U. S. Fish and Wildlife Service, Idaho Fish and Wildlife Office, Boise, Idaho, USA.

USFWS. 2015. Notice of 12 month petition finding – Greater sage-grouse. 80 FR 59857-59942.

USFWS. 2016a. Draft 2016 Conservation Strategy for the Grizzly Bear in the Greater Yellowstone Ecosystem. USDI Fish and Wildlife Service. https://www.fws.gov/mountain-prairie/es/FINALCS.DRAFT_Feb_19_2016_FINAL.pdf

USFWS. 2016b. Endangered and Threatened Wildlife and Plants; Removing the Greater Yellowstone Ecosystem Population of Grizzly Bears from the Federal List of Endangered and Threatened Wildlife. 81 FR 13173.

USFWS. 2016c. Bald and Golden Eagles: Population demographics and estimation of sustainable take in the United States, 2016 update. Division of Migratory Bird Management, Washington D.C., USA.

USFWS. 2016d. Biological Opinion for the wildlife damage management activities in the state of Idaho, Wildlife Services. USDI Fish and Wildlife Service, Idaho Fish and Wildlife Office, Boise ID. 14420-2016-F-0398.

USFWS and USCB. 2011. 2011 national survey of fishing, hunting and wildlife-associated recreation [Idaho]. U.S. Fish and Wildlife Service and U.S. Census Bureau, Washington, D.C., USA.

USGS (U.S. Geological Survey). 2016. Longevity records of North American birds. Bird Banding Laboratory, Laurel, Maryland, USA. http://www.pwrc.usgs.gov/BBL/longevity/Longevity_main.cfm (accessed 3/23/2016).

Verts, B. J. 1967. The biology of the striped skunk. University of Illinois Press, Urbana, Illinois, USA.

Voigt, D. R. 1987. "Red Fox." Pages 378-392 *in* Novak, M., Baker, J. A., Aboard, M. E. and Ballock, B., editors. Wild Furbearer Management and Conservation in North America. Ontario Ministry of Natural Resources, Toronto, Ontario, Canada.

Voigt, D. R., and B. D. Earle. 1983. Avoidance of coyotes by red fox families. Journal of Wildlife Management 47:852-857.

Voigt, D. R., and D. W. Mac Donald. 1984. Variation in the spatial and social behavior of the red fox, *Vulpes vulpes*. Acta Zoologica Fennica.171:261-265.

Von Gunten, B. L. 1978. Pronghorn fawns mortality on the National Bison Range. Proceedings of the Pronghorn Antelope Workshop 8:394-416.

Wade, D. A., and J. E. Bowns. 1982. Procedures for evaluating predation on livestock and wildlife. Texas Agricultural Extension Service, Texas A&M University, College Station, Texas, USA.

Wagner, F. H. 1988. Predator control and the sheep industry. Regina Books, Claremont, California, USA.

Wagner, F. H., and L. C. Stoddart. 1972. Influence of coyote predation on black-tailed jackrabbit populations in Utah. Journal of Wildlife Management 36:329-342.

Wagner, K. K., and M. R. Conover. 1999. Effect of preventive winter aerial coyote hunting on sheep losses to coyote predation. Journal of Wildlife Management 63:606-612.

Waite, T. A., and J. D. Reeve. 1995. Source-use decisions by hoarding gray jays: effects of local cache density and food value. Journal of Avian Biology 26:59-66.

Wakkinen, W. L., and W. F. Kasworm. 2004. Demographics and population trends of grizzly bears in the Cabinet-Yaak and Selkirk Ecosystems of British Columbia, Idaho, Montana and Washington. Ursus Workshop Supplement 15:65-75.

Wakkienen, W. L., B. K. Johnson, and J. B. Slone. 2009. Selkirk ecosystem project. March 2009 Threatened and Endangered Species Project, E-14-12. Idaho Department of Fish and Game, Boise, Idaho, USA.

Wallach, A. D., C. N. Johnson, E. G. Ritchie, and A. J. O'Neill. 2010. Predator control promotes invasive dominated ecological states. Ecology Letters 13:1008-1018.

Waser, N. M., M. V. Price, D. T. Blumstein, S. R. Arozqueta, B. D. Castro Escobar, R. Pickens, and A. Pistoia. 2014. Coyotes, deer, and wildflowers: diverse evidence points to a trophic cascade. Naturwissenschaften (2014) 101:427–436.

Watson, R. T., M. Fuller, M. Pokras and G. Hunt. Eds. 2009. Proceedings of the conference – Ingestion of Spent Lead Ammunition: Implications for Wildlife and Humans. The Peregrine Fund, Boise, ID, USA.

Way, J. G., I. M. Ortega, P. J. Auger and E. G. Strauss. 2002. Box-trapping eastern coyotes in southeastern Massachusetts. Wildlife Society Bulletin 30:695-702.

Weaver, J. L. 1979. Influence of elk carrion upon coyote populations in Jackson Hole, Wyoming. Pages 152-157 *in* M. S. Boyce and L. D. Hayden, editors. Symposium on North American Elk: Ecology, Behavior, and Management. University of Wyoming, Laramie, Wyoming, USA.

Webb, W. C. 2001. Common raven (*Corvus corax*) juvenile survival and movements. Thesis. University of California, Riverside, California, USA.

Webb, W. C., W. I. Boarman, and J.T. Rotenberry. 2004. Common raven juvenile survivorship in a human augmented landscape. Condor 106:517-528.

Webb, W. C., J. M. Marzluff and K. E. Omland. 2011. Random interbreeding between cryptic lineages of the common raven: evidence for speciation in reverse. Molecular Ecology 20:2390-2402.

WGA (Western Governors Association). 2008. Wildife Corridors Initiative. Draft Science Committee Report to the Western Governors. 21pp.

WGFD (Wyoming Game and Fish Department). 2016. Wyoming Grizzly Bear Management Plan. Wyoming Game and Fish Department. Casper, WY.

White, M. 1967. Population ecology of some white-tailed deer in south Texas. Dissertation, Purdue University, Lafayette, Indiana, USA.

White, C. M. and S. K. Sherrod. 1973. Advantages and disadvantages of the use of rotor-winged aircraft in raptor surveys. Raptor Research 7:97-104.

White, C. M. and T. L. Thurow. 1985. Reproduction of ferruginous hawks exposed to controlled disturbance. Condor 87:14-22.

Wielgus, R. B. and K. A. Peebles. 2014. Effects of wolf mortality on livestock depredations. PloS One 9(12)e113505.

Williams, J. F., H. Lopez Adaros, and A. Trejos. 1971. Current prevalence and distribution of hydatidosis with special reference to the Americas. American Journal of Tropical Medicine and Hygiene 20:224-236.

Willis, M. J., G. P. Keister, D. A. Immell, D. M. Jones, R. M. Powell, and K. R. Durbin. 1993. Sage-grouse in Oregon. Wildlife Research Report Number 15. Oregon Department of Fish and Wildlife, Portland, Oregon, USA.

Windberg, L. A. 1995. Demography of a high-density coyote population. Canadian Journal of Zoology 73:942-954.

Wright, P. L. 1966. Observations on the reproductive cycle of the American badger (*Taxidea taxus*). *In* Comparative biology of reproduction in mammals. Symposia of the Zoological Society of London 15:37-45.

Wright, P. L. 1969. The reproductive cycle of the male American badger (*Taxidea taxus*). Journal of Reproduction and Fertilization Supplement 6:435-445.

Yeager, L. E. and R. G. Rennels. 1943. Fur yield and autumn foods of the raccoon in Illinois River bottom lands. Journal of Wildlife Management 7:45-60

Yensen, E., and P. W. Sherman. 1997. *Spermophilus brunneus*. Mammalian Species 560:1-5.

APPENDIX B

POTENTIAL WS-IDAHO ACTIVITIES ON AREAS OF SPECIAL CONCERN

This table provides information on the types of lethal PDM actions which could potentially be implemented on areas of special concern. WS-Idaho could also provide technical assistance to producers and landowners/managers on nonlethal methods that they could implement to reduce damage and conflicts. WS-Idaho activities are only conducted in response to a need for action and listing of a method in this table does not guarantee that it will be used, only that it may be used if a need should arise, the alternative is identified as appropriate for the specific situation using the WS Decision Model, and is allowed under the management alternative selected based on this EA.
re

* Chance of Work Legend:		Chance that work will be done within next 5 years:	
EH	Extremely High	95 - 100%	Historical depredation - expect it to continue
H	High	66 - 95%	Historical depredation - may not continue
M	Medium	33 - 66%	Historical depredation nearby - may not continue
L	Low	2 - 33%	Historical depredation nearby - expect none
EL	Extremely Low	0 - 2%	No historical depredation - expect none to start

+ - Recommended Listing as Wilderness	
* - Not listing as Wilderness	
** - Supported partial listing	

Property Type	Property Name		Land Management Agency	Acres	Control Strategies/Tools Proposed					
					M-44	Trap	Aircraft	Shooting	Snare	Chance of Work*
Wilderness Areas (WA)	Jacks Creek Complex	Big Jacks Creek Little Jacks Creek	BLM	103,683	No	Yes	No	Yes	Yes	EL
	Boulder-White Cloud Complex	Hemingway-Boulders Jim McClure-Jerry Peak White Clouds	US Forest Service	275,665	No	Yes	No	Yes	Yes	EH
	Bruneau-Jarbidge Rivers		BLM	89,820	No	Yes	No	Yes	Yes	EL
	Craters of the Moon		National Parks Service	43,243	No	No	No	No	No	EL
	Frank Church-River of No Return		US Forest Service	2,357,715	No	No	No	Yes	No	EL
	Gospel Hump		US Forest Service	205,395	No	No	No	Yes	No	L
	Hells Canyon		US Forest Service	217,497	No	No	No	Yes	No	EL
	North Fork Owyhee		BLM	43,391	No	Yes	No	Yes	Yes	EL

	Owyhee River		BLM	267,137	No	Yes	No	Yes	Yes	EL
	Pole Creek		BLM	12,529	No	Yes	No	Yes	Yes	EL
	Sawtooth		US Forest Service	217,726	No	Yes	No	Yes	Yes	EL
	Selway-Bitterroot		US Forest Service	1,347,644	No	No	No	Yes	No	EL
Areas of Critical Concern (ACEC)	Boise Front		BLM	12,000	No	No	Yes	Yes	No	M
	Four Rivers Complex	Buckwheat Flats Goodrich Creek Lost Basin Grassland Rebecca Sand Hill Summer Creek Sand-capped Knob Sand Hollow	BLM	200	No	No	Yes	Yes	No	EL
	Henry's Lake		BLM	2,415	No	Yes	No	Yes	Yes	L
	Hixon Columbia Grouse Habitat		BLM	4,200	No	Yes	Yes	Yes	Yes	M
	Hulls Gulch		BLM	120	No	Yes	Yes	Yes	Yes	L
	Long-billed Curlew Habitat		BLM	61,000	No	Yes	Yes	Yes	Yes	L
	Mud Flat "Shoofly" Oolite		BLM	5	No	Yes	Yes	Yes	Yes	M
	North Menan Butte		BLM	1,124	No	Yes	No	Yes	Yes	L
	Snake River		BLM	20,351	No	Yes	Yes	Yes	Yes	H
	Upper Snake Complex	Nine Mile Knoll St Anthony Dunes	BLM	44,168	No	No	No	No	No	EL
Wilderness Study Areas (WSA)	Crystal Lake *		BLM	9,027	No	No	No	No	No	EL
	Grandmother Mountain *		BLM	15,019	No	No	No	No	No	EL
	Selkirk Crest *		BLM	720	No	No	No	No	No	EL
	Marshall Mountain *		BLM	5,804	No	Yes	No	Yes	Yes	M
	Snowhole Rapids *		BLM	5,068	No	No	No	No	No	EL
	King Hill Creek *		BLM	29,309	No	Yes	Yes	Yes	Yes	H
	Box Creek *		BLM	440	No	No	No	No	No	EL
	Lower Salmon Falls Creek *		BLM	3,500	No	No	No	No	No	EL
	Great Rift +		BLM	45,077	No	No	Yes	Yes	No	EL
	Bear Den Butte *		BLM	5,411	No	Yes	Yes	Yes	Yes	L
	Black Butte *		BLM	4,068	No	Yes	Yes	Yes	Yes	M

	Black Canyon *	BLM	15,771	No	Yes	Yes	Yes	Yes	M
	Deer Creek *	BLM	7,487	No	Yes	Yes	Yes	Yes	H
	Friedman Creek *	BLM	9,773	No	Yes	No	Yes	Yes	EL
	Gooding City of Rocks East +	BLM	14,743	No	Yes	No	Yes	Yes	L
	Gooding City of Rocks West +	BLM	6,287	No	Yes	No	Yes	Yes	L
	Lava *	BLM	23,680	No	Yes	Yes	Yes	Yes	M
	Little City of Rocks *	BLM	5,875	No	Yes	Yes	Yes	Yes	M
	Little Deer *	BLM	13,458	No	Yes	Yes	Yes	Yes	L
	Little Wood River +	BLM	4,265	No	Yes	No	Yes	Yes	L
	Raven's Eye +	BLM	29,899	No	Yes	Yes	Yes	Yes	L
	Sand Butte +	BLM	20,792	No	Yes	Yes	Yes	Yes	L
	Shale Butte *	BLM	15,968	No	Yes	Yes	Yes	Yes	M
	Shoshone *	BLM	6,914	No	Yes	No	Yes	Yes	M
	Eighteenmile **	BLM	24,922	No	No	No	No	No	EL
	Borah Peak +	BLM	3,880	No	Yes	No	Yes	Yes	L
	Burnt Creek +	BLM	24,980	No	Yes	No	Yes	Yes	L
	Goldbury *	BLM	3,290	No	Yes	No	Yes	Yes	M
	Appendicitis Hill *	BLM	21,900	No	Yes	Yes	Yes	Yes	M
	Cedar Butte *	BLM	35,700	No	Yes	Yes	Yes	Yes	L
	China Cup Butte *	BLM	160	No	Yes	Yes	Yes	Yes	EL
	Hawley Mountain *	BLM	15,510	No	Yes	Yes	Yes	Yes	M
	Hell's Half Acre +	BLM	66,200	No	Yes	Yes	Yes	Yes	L
	Henrys Lake +	BLM	350	No	Yes	Yes	Yes	Yes	L
	Sand Mountain *	BLM	21,100	No	Yes	No	No	Yes	M
	Snake River Islands *	BLM	770	No	No	No	No	No	EL
	White Knob Mountains *	BLM	9,950	No	Yes	Yes	Yes	Yes	M
	Petticoat Peak *	BLM	11,298	No	Yes	Yes	Yes	Yes	M
	Worm Creek +	BLM	40	No	No	No	No	No	EL

National Reserves - Monuments -Parks - Sites - Trails - Wildlife Refuges	California National Historic Trail	National Parks Service	unknown	No	No	Yes	Yes	No	EL
	Lewis & Clark Historic Trail	National Parks Service	unknown	No	Yes	Yes	Yes	No	EL
	Oregon Historic Trail	National Parks Service	unknown	No	Yes	Yes	Yes	No	EL
	City of Rocks National Reserve	National Parks Service	14,407	No	Yes	No	Yes	Yes	EL
	Craters of the Moon National Monument	National Parks Service	43,243	No	No	No	No	No	EL
	Hagerman Fossil Beds National Monument	National Parks Service	4,350	No	No	No	No	No	EL
	Minidoka Historic Site	National Parks Service	6	No	No	No	No	No	EL
	Nez Perce Historic Park	National Parks Service	4,561	No	No	No	No	No	EL
	Yellowstone National Park	National Parks Service	221,900	No	No	No	No	No	EL
	National Wildlife Refuges	US Fish & Wildlife Service	74,380	No	Yes	No	Yes	Yes	EL

APPENDIX C

WILDLIFE DAMAGE MANAGEMENT METHODS AUTHORIZED FOR USE OR RECOMMENDED BY WS-IDAHO

A. Mechanical Management Methods

1. Livestock producer practices consist primarily of nonlethal preventive methods such as animal husbandry, habitat modification and animal behavior modification. Livestock husbandry and other management techniques are implemented by the livestock producer. Producers are encouraged to use these methods, based on the level of risk, need and practicality.

a. Animal husbandry, which generally includes modifications in the level of care or attention given to livestock which may vary depending on the class, age and size of the livestock. Animal husbandry practices include but are not limited to techniques such as livestock guarding dogs and other animals, herders, shed lambing, carcass removal, night penning, etc.

Herders - Almost all of Idaho's large free range sheep operators employ the use of herders to tend sheep and to deal with predatory wildlife causing injury or death of livestock. Herders often employ a wide variety of nonlethal control measures while performing their daily duties: caring for and training guard dogs; burying dead livestock where permitted by terrain; deploying, maintaining and moving propane cannons; shooting harassment; and general animal husbandry.

Range Riders – Range riders are very similar to herders except they are associated with cattle operations. The "cowboys" are responsible for the health and wellbeing of the cattle, including protecting them from predators. The effectiveness of reducing losses to predation is a result of the cowboys' tools, knowledge and skill.

Carrion/carcass Removal – Several Idaho livestock produces remove or bury dead livestock to reduce attraction of predators to the area, however, this practice is not practical in many areas of Idaho due to remoteness, rocky terrain and accessibility. In short, removing and disposing of dead livestock is employed when feasible and will be a continued practice for Idaho livestock producers.

Season and location of lambing or calving areas - The highest predation loss of sheep and calves typically occurs from late spring through September, when most predators increase their food intake to raise their young. Husbandry practices such as shortening the lambing and calving periods by using synchronized or group breeding is utilized by the majority of livestock producers in Idaho to reduce predation.

Additionally, several Idaho sheep producers shed lamb and cattle producers' calf in small pastures until they reach an age structure to help the vulnerable livestock elude predation. Some Idaho livestock producers practice early weaning and do not allow young to go out to large pastures or grazing areas, which reduces the likelihood of excessive predation. This practice is utilized for the livestock producers who operate solely on private land.

Behavior Selection of Livestock – Most Idaho cattle producers breed cattle for their "mothering" ability which can help reduce losses to predation. A few will even breed cattle with a very outgoing temperament to protect themselves and their young; this is most common on range operations where the cattle are left unattended for several weeks without much interaction from the livestock producer or range rider. This type of breeding is also doubled with leaving horns on the cows, allowing them to better defend themselves and their young against predators.

b. Habitat modification alters habitats to attract or repel certain wildlife species or to separate livestock from predators. Habitat modification practices would be encouraged when practical, based on the type and extent of the livestock operation. For example, on private lands, clearing brushy or wooded areas in or adjacent to lambing or calving pastures may be appropriate to reduce available cover for predators.

c. Animal behavior modification refers to tactics that alter the behavior of wildlife to help reduce predation. Animal behavior modification could be scare tactics or fencing to deter or repel animals that cause loss or damage to livestock or property. Some, but not all devices used to accomplish this are:

Predator-proof Fences – The responsibility for erecting and maintaining predator-proof fencing is normally borne by individual livestock producers. WS-Idaho's participation is normally providing technical assistance and information on the various types of fencing and materials available. Predator proof fencing has been effective where livestock do not leave an area, however, even with the electric fences and five foot high fencing, predators such as black bears will climb over the tops of the fences and absorb the electric shock, whereas mountain lions leap over the fences to access and depredate the livestock. The cost for predator proof fences on private lands often outweighs the benefits of producing livestock when the fence is not capable of excluding all predators.

Temporary Fencing – As with predator-proof fences, erecting and maintaining temporary fencing is normally born by individual livestock producers. The most common uses of such fencing include placing temporary electric wire or polytape fencing around bedding areas to deter predation while the livestock producer moves the livestock to another pasture or takes them to market. They can also be used as night bedding pens for sheep as they are being grazed on open range. The temporary fence may need to be moved daily for various husbandry or livestock management reasons.

These systems may also be used around small pastures but the period of efficacy may be limited as predators habituate to or learn to avoid systems which are installed for extended periods of time.

Night Penning – The responsibility for penning or corralling livestock at night is individual livestock producers. Livestock producers occasionally have the resources and conditions to place livestock in protective confinement, such as night pens. Experienced drawbacks to night penning in Idaho include: not practical or ecologically sound for free ranging cattle and sheep that are dispersed over large geographical areas to be confined in a small area (over grazing does not benefit ranching for following years); and restrains the livestock for predatory wildlife that are not hindered by penning (such as mountain lions or black and grizzly bears) that can cause extreme losses in a very short amount of time.

Electronic Guard (siren strobe-light device) - The Electronic Guard (siren strobe-light device) is a battery-powered, portable unit that houses a strobe light and siren. This device was developed by the NWRC (Linhart 1983, Linhart et al. 1992). The device is a short-term tool used to deter predation until livestock can be moved to another pasture or other predator damage management methods are implemented. The device automatically activates at nightfall and is programmed to discharge periodically throughout the night. Efficacy of strobe/sirens is highly variable, but in certain situations, has been used successfully to reduce coyote and black bear depredation on sheep. The technique has proven most successful when used at "bedding grounds" where sheep gather to sleep for the night. Electronic guards may be used in rural and urban settings. Use in some areas may be precluded because of noise impacts on neighboring landowners or recreationists.

Propane Exploders - Propane gas exploders are occasionally used by WS-Idaho to haze and harass predators from depredating on livestock. Propane exploders operate on propane gas and are designed to produce loud explosions at controllable intervals. They are strategically located (*i.e.*, elevated above the vegetation) in areas of high wildlife use to frighten animals from the problem site. Because animals are known to habituate to sounds, exploders must be frequently moved and used in conjunction with other scare devices. Exploders can be left in an area after dispersal is complete to discourage returning animals.

Due to noise restrictions in urban environments, propane exploders are rarely used in these areas. The vast majority of propane exploder use is in rural areas around lambing and calving pastures to help minimize predation from coyotes, wolves and other predators.

Pyrotechnics - Pyrotechnics, including shell-crackers and scare cartridges, are occasionally used by WS-Idaho to repel primarily birds, but on predators as well.

Shell-crackers are a 12-gauge shotgun shell containing a firecracker that is projected up to 75 yards in the air before exploding.

Scare cartridges (sometimes referred to as bird bangers, whistle bombs, racket bombs and rocket bombs) are fired from a 15 millimeter flare pistol and their use is similar to shell-crackers. Bird bangers are firecrackers that travel about 75 feet before exploding and producing a loud boom. The whistle bomb (also called screamers) travels similarly to a noise bomb but produce a visible trail of smoke and fire, as well as a whistling sound throughout the time of travel. Racket bombs make a screaming noise in flight but do not explode and rocket bombs are similar to noise bombs but may travel up to 150 yards before exploding.

Lights - A variety of lights, including strobe, barricade and revolving units, are used with mixed results to frighten predators. Brilliant lights, similar to those used on aircraft, are most effective in frightening night-feeding birds and mammals. These extremely bright-flashing lights have a blinding effect, causing confusion that reduces the predator's ability to locate the prey.

Flashing amber barricade lights, like those used at construction sites, and revolving or moving lights may also frighten predators when these units are placed on raceway walls, fish pond banks or ingress corridors. However, most predators rapidly become accustomed to such lights and their long-term effectiveness is questionable. In general, the type of light, the number of units and their location are determined by the size of the area to be protected and by the power source available.

Harassment - Scaring and harassment techniques to frighten animals are probably the oldest methods of combating wildlife damage. A number of sophisticated techniques have been developed to scare or harass wildlife from an area. The use of noise-making devices is the most popular and commonly used; however, other methods, including aerial hazing and visual stimuli, are also used. Harassment using vehicles, people, falcons or dogs is used to frighten predators or birds from the immediate vicinity. Boats, planes, automobiles and all-terrain vehicles are used as harassment methods. As with other wildlife damage control 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 (see Shooting).

2. Foothold Traps can be effectively used to capture a variety of mammals, but are used most often to capture coyotes and red fox. Two primary advantages of the foothold trap are that they can be set under a wide variety of conditions and that pan-tension devices can be used to reduce the incidence of capturing smaller non-target animals. Effective trap placement and use of appropriate lures by trained personnel also contribute greatly to the foothold trap's selectivity. An additional advantage is that foothold traps can allow for the on-site release of some non-target animals.

Disadvantages include the difficulty of keeping traps operational during rain, snow or freezing weather. In addition, they lack selectivity where non-target species are of a similar or heavier weight than the target species. The use of foothold traps is more labor-intensive than some methods, but they are indispensable in resolving some depredation problems.

3. **Quick-kill Traps** are used by WS-Idaho infrequently to take predators such as raccoons and skunks. Quick-kill traps come in a variety of styles, but the most commonly used by WS-Idaho is the body-gripping trap. The body-gripping trap is lightweight, easily set and consists of a pair of rectangular wire frames that close when triggered, killing the captured animal with a quick body blow. The most commonly used trap is the Conibear® which is normally set in the den entrances or travel corridors of skunks and raccoons and in the entrance of a wooden box or other structure having food or bait placed inside so the animal will trigger the trap when attempting to access the bait. WS policy prohibits the use of body-gripping traps with a jaw spread exceeding eight inches for land sets. Quick-kill traps set for skunks and raccoons are primarily used in rural areas, limiting non-target animal trap exposure. Quick-kill traps are lethal to both target and non-target animals.

4. **Cage Traps**, typically constructed of wire mesh, are sometimes used or recommended to capture smaller animals like raccoons or skunks. Larger cage traps constructed of sections of culvert pipe are sometimes used to capture black bears or grizzly bears. Cage traps pose minimal risk to humans, pets and other non-targets and they allow for on-site release or relocation of animals, but they cannot be used effectively to capture warier species such as coyotes.

5. **Snares**, like traps, may be used as either lethal or live-capture devices. Snares may be used wherever a target animal moves through a restricted area (*i.e.*, crawl holes under fences, trails through vegetation, etc.). They are easier to keep operational during periods of inclement weather than are foothold traps. Snares set to catch an animal by the neck can be a lethal use of the device, whereas snares positioned to capture the animal around the body or leg can be a live-capture method. Careful attention to details in placement of snares and the use of a "stop" on the cable can also allow for live capture of neck-snared animals. Spring-activated foot snares are sometimes used to capture depredating mountain lion or black and grizzly bears.

6. **Ground Shooting** with a rifle, shotgun or handgun is highly selective for target species and may involve the use of spotlights, decoy dogs and predator calling. Removal of one or two specific animals by shooting in the area where depredations occur can sometimes provide immediate relief from a predation problem. Shooting is often tried as one of the first lethal control options because it offers the potential of solving a problem more quickly and selectively than some other options, but it does not always solve predation problems. Shooting may sometimes be one of the only control options available if other factors preclude the setting of equipment.

7. Aerial Shooting typically involves the shooting of coyotes or red fox from fixed-winged aircraft or helicopters and is used on all lands where authorized and determined appropriate. Aerial shooting consists of visually sighting target animals in the problem area and shooting them with a shotgun, or in rare occasions with a rifle, from the aircraft. Shooting typically results in a relatively quick and humane death. Local depredation problems can often be resolved quickly through aerial shooting. Cain et al. (1972) rated aerial shooting as "very good" in effectiveness for problem solving, safety and lack of adverse environmental impacts. Smith et al. (1986) cited cost- effectiveness and efficacy as benefits of aerial shooting for protection of pronghorn antelope from coyote predation. Connolly and O'Gara (1987) documented that at least 55% of the coyotes taken by aerial shooting in their study area were confirmed sheep-killing coyotes. Wagner and Conover (1999) documented that aerial shooting conducted on mountainous summer grazing allotments during the late winter months was effective in reducing sheep losses the following summer and that it also reduced the need to deploy equipment such as foothold traps and snares, which are less selective than aerial shooting.

Good visibility is required for effective and safe aerial shooting operations and relatively clear and stable weather conditions are necessary. Summer conditions limit the effectiveness of aerial shooting as heat reduces coyote activity and visibility is greatly hampered by vegetative ground cover. High temperatures, which reduce air density, affect low-level flight safety and may further restrict aerial shooting activities.

8. Trained Dogs are essential to the successful tracking and capture of problem black bears and mountain lions. Dogs are also trained and used for coyote damage management to alleviate livestock depredation (Rowley and Rowley 1987, Coolahan 1990). Trained dogs are used primarily to find coyotes and dens and to pursue or decoy problem animals.

9. Denning is the practice of finding coyote or red fox dens and eliminating the young, adults or both to stop ongoing predation or prevent future depredation on livestock. Till and Knowlton (1983) documented denning's cost-effectiveness and high degree of efficacy in resolving predation problems due to coyotes killing lambs in the spring. Coyote and red fox depredations on livestock often increase in the spring and early summer due to the increased food requirements for rearing and feeding litters of offspring. Removal of the young will often stop depredations even if the adults are not taken. When adults are taken and the den site is found with young, they are usually killed to prevent their starvation. Pups are typically euthanized in the den through use of a registered gas fumigant cartridge. (See discussion of gas cartridge under **Chemical Management Methods**).

10. Egg, Nest and Hatchling Removal and Destruction. Egg and nest destruction is used mainly to control or limit the growth of a nesting population in a specific area through limiting reproduction of offspring or removal of nest to other locations. Egg and nest destruction is practiced by manual removal of the eggs or nest. Hatchlings or non-fledged young are collected from the nest and humanely euthanized. Common euthanasia methods are thoracic squeeze, CO_2 and cervical dislocation.

11. Egg Addling/Oiling is the practice of destroying the embryo prior to hatching. Addling is conducted by vigorously shaking an egg numerous times which causes the detachment of the embryo from the egg sac. Oiling is conducted by spraying the eggs with an oil liquid which covers the entire egg and prevents the egg from obtaining oxygen. Although WS-Idaho does not commonly use egg addling or oiling, it is a valuable damage management tool and has shown to be effective.

12. Relocation of Problem Wildlife. Relocation may be appropriate in some situations such as if the problem species' population is at very low levels, there is a suitable relocation site and the additional dollars required for relocation can be obtained. However, those species that often cause damage problems (i.e., coyotes, red foxes, black bears and mountain lions) are relatively abundant in much of the suitable habitat in Idaho, and relocation is not necessary for the maintenance of viable populations. Relocation of predators implicated in livestock depredation may result in future depredations if the predator encounters livestock again, and in the case of black bears and mountain lions in Idaho, could also require payment of damage compensations claims. In an MOU between IDFG and the ISADCB, black bears and mountain lions involved in killing livestock outside of the legal hunting seasons for these species will be dispatched in a humane manner (IDFG 2006). Livestock depredations that occur during the legally-established sport hunting seasons for that area, WS-Idaho and IDFG will try of facilitate hunter harvest of specific depredating animals whenever practical. Should relocation of livestock depredating black bears and mountain lions be considered, any relocation will be coordinated by IDFG in consultation with the appropriate land management agencies and land users, as required under *Idaho Code* 36-1109.

The American Veterinary Medical Association, the National Association of State Public Health Veterinarians and the Council of State and Territorial Epidemiologists all oppose the relocation of mammals because of the risk of disease transmission, particularly for small mammals such as raccoons or skunks (CDC 1990). Although relocation is not necessarily precluded in all cases, it would in many cases be logistically impractical and biologically unwise.

B. Chemical Management Methods

All chemicals used by WS-Idaho are registered under the Federal Insecticide, Fungicide and Rodenticide Act and administered by the Environmental Protection Agency (EPA) and the Idaho State Department of Agriculture (ISDA). All WS-Idaho field personnel who apply restricted-use pesticides are certified as Professional Applicators by the ISDA. No chemicals are used on public or private lands without prior consultation with the land management agency or property owner/manager. The chemical methods used and/or currently authorized for use in Idaho are:

1. Sodium cyanide is used in the M-44 device. The M-44 is a spring-activated ejector device developed specifically for coyote damage management (EPA Reg. No. 56228-15). The M-44 consists of a capsule holder wrapped in an absorbent material, an ejector mechanism, a capsule containing about 0.9 grams of a powdered sodium cyanide mixture with an inert biological marker and a five to seven inch hollow stake. To set an M-44, a good location is found, the hollow stake is driven into the ground, the ejector unit is cocked and fastened into the stake by a slip ring. The wrapped capsule holder containing the cyanide capsule is then screwed onto the ejector unit and thick, liquid bait is applied to the outside of the capsule holder. An individual warning sign is placed within 25 feet to alert others of the device's presence and area warning signs are placed at commonly used access points to the area. Coyotes or foxes attracted to the bait will bite and try to pick up the baited capsule holder. When the M-44 is pulled, the spring-activated plunger propels cyanide into the animal's mouth, resulting in a quick death. Coyotes killed by M-44s present no secondary poisoning risks to other animals that may scavenge on the coyote's carcass.

The M-44 can be used very effectively during winter and early spring months when foothold traps are more difficult to keep functional and M-44s are typically more selective for target species than foothold traps. They may also be more economical as a control tool, because they do not have to be monitored as often as traps or snares.

The M-44 is very selective for coyotes because of the attractants used and the unique requirement that the device be triggered by pulling straight up on it. Connolly (1988), in an analysis of M-44 use by WS-Idaho from 1975-1986, documented a 99% selectivity rate for target species. Domestic dogs are susceptible to M-44s and discretion must be used when setting M-44s in areas that may be frequented by dogs. The 26 EPA use restrictions also preclude use of the M-44 in areas where it may pose a danger to T/E species.

M-44s are used for corrective and preventive damage management on private lands where authorized by landowner agreement and on State and federal lands where authorized by Work Plans. Most M-44 use typically occurs on private lands; however, limited use occurs on U.S. Bureau of Land Management (BLM) lands and no M-44s have been used on any National Forest lands within the past 15 years. M-44 use on BLM or Forest Service lands would occur only after prior project- by-project consultation with the responsible land management agency at the Regional, State or local level. WS-Idaho personnel comply with the EPA label and 26 use restrictions.

2. **The gas cartridge** is registered as a fumigant by the EPA (EPA Reg. No. 56228-21) and is used in conjunction with denning operations in Idaho. When ignited, the cartridge burns in the den of an animal and produces large amounts of carbon monoxide, a colorless, odorless, tasteless gas. The combination of carbon monoxide exposure and oxygen depletion kills the young in the den. This technique is used on private and public lands where livestock depredation can be attributed to food procurement for young.

3. **The Livestock Protection Collar (LPC)**, developed for protection of sheep from coyote predation, is registered with the EPA (EPA Reg. No. 56228-22) and the ISDA for use in Idaho only by trained and certified WS-Idaho employees. The LPC consists of two rubber reservoirs, each of which contains 15 ml. of a 1% solution of sodium fluoroacetate (Compound 1080). The collar has Velcro straps for attachment around the neck of the sheep, with the reservoirs fitting on the throat just behind the jaw. Coyotes typically attack sheep by biting them on the throat

and holding on until the animal suffocates or stops struggling. Coyotes that attack collared sheep generally puncture the collar with their teeth (about 75% of the time) and receive a lethal oral dose of the toxicant. In this usage, there are no significant secondary hazards.

Label restrictions limit use of the LPC to fenced pastures; it cannot be used on open rangelands. Use of the LPC typically involves establishment of a "target flock" of 50-100 animals, 20-30 of which would be collared lambs. These animals would be exposed in a high risk pasture where coyote attacks have occurred. Other (uncollared) sheep would be moved to a safe area or penned until a coyote attacks a collared animal and punctures a collar and predation stops.

The outstanding advantage of the LPC is its selectivity in eliminating only those individual coyotes that are responsible for killing sheep. Disadvantages include the limited applicability of this technique, death of collared livestock that are attacked, the logistics of having to collar and monitor the collared sheep and the management efforts required to protect livestock other than the target flock (Connolly et al. 1978, Burns et al. 1988). From an efficacy standpoint, use of the LPC is best justified in areas with a high frequency of predation (at least one kill per week).

Sodium fluoroacetate has been a subject of wide research in the United States and elsewhere and has been widely used as a toxicant for pest management programs in many countries. Fluoroacetic acid and related chemicals occur naturally in plants in many parts of the world and are not readily absorbed through intact skin (Atzert 1971). Sodium fluoroacetate is discriminatingly toxic to predators, being many times more lethal to them than to most non-target species (Atzert 1971, Connolly and Burns 1990).

The LPC has received only limited use by WS-Idaho since it was first registered for use in the State in 1999, but it remains a potentially valuable tool in certain circumstances. LPCs have only been used on a total of four properties in the southern Idaho analysis area during the period of 1999 to 2001. Because of the restrictions on use of this method, WS-Idaho is phasing out use of LPCs and expects to have no use of this method in CY 2017.

DRC-1339 (3-chloro-4-methylbenenamine hydrochloride) is a slow acting avian toxicant that is rapidly metabolized and/or excreted (Cunningham et al. 1979, Schafer 1981, Knittle et al. 1990). The excreted metabolites are non-toxic (Cunningham et al. 1979). The majority of birds that consume the bait die within 24 hours, but most within four to twelve hours. Birds receiving a lethal dose die a quiet death with no flapping, vocalization or any other indicator of pain or distress (Schwab et al. 1964, Timm 1983, Wade 2006, Cowan et al. 2010). About four hours before death, the birds cease to eat or drink and become listless and inactive. They perch with their feathers ruffled (as if cold) and appear to doze. DR-1339 causes renal failure in treated birds.

This compound is unique because of its relatively high toxicity to most pest birds but low-to-moderate toxicity to most raptors and almost no toxicity to mammals (DeCino et al. 1966, Palmore 1978, Schafer 1984, Schafer 1991). The product is rapidly metabolized with 80-90% of

DRC-1339 administered to birds is excreted in the form of parent compound or metabolite within the first four hours after consumption (Apostolou 1969, Apostolou and Peoples 1971, Mull 1971, Giri et al. 1976, Goldade et al 2004). Time to death for DRC-1339 is typically > 24hrs. Given the typical time until death for DRC-1339 and the rapid metabolism of the product, carcasses of birds found in the field are unlikely to contain significant DRC-1339 residues or its metabolites and pose little risk of secondary poisoning to non-target animals (Cunningham et al. 1979, Schafer 1981, Knittle et al. 1990, Goldade et al. 2004).

The first symptoms of DRC-1339 poisoning are an increase, followed by a sharp decrease, in water intake. About four hours before death the birds cease to eat or drink and become listless and inactive. They perch with their feathers ruffled (as if cold) and appear to doze. As the poison continues to act, their breathing rate increases slightly and breathing becomes more difficult. Most birds become unconscious before death, and time to death varies from 3 to 50 hours depending on the quantity of toxicant ingested. Convulsions, spasms, or distress calls have not been observed, and birds die a quiet death (Schwab et al. 1964, Timm 1983, Cowan et al. 2010).

DRC-1339 is registered with the EPA (EPA Reg. No. 56228-10) to control crows, ravens and magpies when causing damage at feedlots and (EPA Reg. No. 56228-29) to control crows, ravens and magpies that prey on newborn livestock or on the eggs or young of wildlife species needing special protection. The DRC-1339, under EPA Reg. No. 56228-29, is incorporated into either whole egg or small meat baits (Larsen and Dietrich 1970). The use of egg baits to deliver DRC-1339 further reduces any likelihood of potential risk to hawks or eagles since these species do not typically prey on eggs. The feeding habits of the target species are observed before placing any treated baits in an area to reduce the risks to non-target animals. Corvids (ravens, crow and magpies) are opportunistic feeders and by determining when and where the birds are feeding, the baits can be found more quickly and easily, thereby reducing the risks to non-target animals. Selective damage management can be applied because corvids learn to exploit a readily available food source and they will continue to focus on that source until the availability declines.

In 2014, the ISDA issued a FIFRA Section 24(c) registration (SLN Registration #ID-140005) for Compound DRC-1339 (EAP Reg. No. 56228-29) that allows IDFG personnel to use DRC-1339 to control ravens, crows and magpies to protect federally-designated T/E species or other species designated to be in need of special protection by federal or State wildlife agencies, or to control the target species within 100 feet of utility poles, electrical line towers, communication towers or other man-made structures where their activities cause fire threat, threat to human health and safety, threat to sensitive wildlife species or damage to the structures.

4. Chemical Repellents. Chemical repellents are compounds that prevent consumption of food items or use of an area. They operate by producing an undesirable taste, odor, feel or behavior pattern. Effective and practical chemical repellents should be nonhazardous to wildlife; nontoxic to plants, seeds and humans; resistant to weathering; easily applied; reasonably priced; and capable of providing good repelling qualities. The reaction of different animals to a single chemical formulation varies and for any species there may be variations in repellency between different habitat types. Lithium chloride and capsicum derivatives have been examined as mammalian predator repellents, but no successful application has yet been found. Mesurol is registered with the EPA (EPA Reg. No. 56228-33) as an avian repellent and deterrent for ravens and crows that destroy eggs of protected, federally designated T/E species. Mesurol is toxic to fish and very highly toxic to birds and mammals. Eggs similar in appearance to those species to be protected are treated with Mesurol (methiocarb). Upon ingestion, the ravens or crows becomes sick and may develop an aversion to consuming similar-looking eggs. Development of chemical repellents is expensive and cost prohibitive in many situations. Chemical repellents are strictly regulated and suitable repellents are not available for many wildlife species or wildlife damage situations.

5. Chemical Immobilization/Euthanasia are registered chemicals authorized for immobilization and euthanasia of certain wildlife. Selected WS-Idaho personnel have received training in the safe use of immobilization/euthanasia chemicals and are certified by WS-Idaho. This training involves hands-on application of state-of-the-art techniques and chemicals. All immobilizing agents used by WS-Idaho are approved by the Food and Drug Administration (FDA) or U. S. Drug and Enforcement Agency.

a. Telazol® is a combination of equal parts of tiletamine hydrochloride and zolazepam hydrochloride. Telazol® is rapid acting, nonnarcotic, nonbarbiturate injectable anesthetic agents, having a wide margin of safety. This drug produces unconsciousness known as "dissociative" which in general terms means reflexes needed to sustain life (breathing, coughing, swallowing, etc.) are not affected by the drug. Telazol® is used to immobilize live-trapped animals for relocation or administered before euthanasia. The product is generally supplied in vials, each containing 500 mg of dry, active drug. The drug is reconstituted with sterile water to form an injectable liquid. 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 five to twelve 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 within one to two hours.

b. Potassium chloride, a common laboratory chemical, is injected by WS-Idaho personnel as a euthanizing agent after an animal has been anesthetized.

c. Carbon Dioxide (CO2) is sometimes used to euthanize birds or small predators (i.e. raccoons, skunks, etc.) which are captured in live traps or hand-captured. The animals are placed in a container such as a plastic 5-gallon bucket or metal chamber and sealed shut. CO_2 gas is released into the bucket or chamber and the animals quickly die after inhaling the gas.

6. Tranquilizer Trap Devices (TTD) - TTDs are rarely used by WS-Idaho. They are small rubber containers filled with the tranquilizer propiopromazine HCL that can be used in conjunction with foothold traps to sedate an animal upon its capture. The drug is administered via a rubber nipple (trap tab) fastened to the trap jaw. When captured, predators instinctively bite the trap tab and ingest the immobilizing drug, whereby sedating them, reducing possible damage to their foot caused by struggling while being held by the trap. Used properly it does not render the animal unconscious.

7. Measurol. Mesurol is a chemical repellent used for nonlethal taste aversion. It is registered by the EPA and the ISDA for aversive conditioning egg treatment to reduce predation from common ravens (*Corvus corax*), white-necked ravens (*C. cryptoleucas*) and American crows on the eggs of protected, T/E species or eggs of other species designated to be in need of special protection (EPA Reg. No. 56228-33). Mesurol is registered for WS use only. The active ingredient is methiocarb which is a carbamate pesticide which acts as a cholinesterase inhibitor. Species which feed upon treated eggs may show signs of toxicity (e.g. regurgitation, lethargy, temporary immobilization). Occasionally, birds may die after feeding upon treated eggs, but most birds exposed to treated eggs survive. Avery et al. (1995) examined the potential of using eggs injected with 30mg of methiocarb to condition common ravens from preying on eggs of endangered California least terns (*Sterna antillarum*). The result concluded that proper deployment of treated eggs can be a useful, nonlethal method of reducing raven predation at least tern colonies. Avery and Decker (1994) evaluated whether predation might be reduced through food avoidance learning. They used captive fish crows (*Corvus caurinus*) to examine avoidance response from methiocarb (18mg/egg) and methyl anthranilate (100mg/egg). Their conclusion showed that some crows displayed persistence to the five-day exposure and that successful application may require extended period of training for target predators to acquire an avoidance response. During the spring of 2001, WS-Idaho conducted a field test on the Sterling Wildlife Management Area in Bingham County, Idaho, where Mesurol treated eggs were exposed to black-billed magpies (*Pica hudsonia*) to evaluate aversive conditioning to eggs of waterfowl and upland game birds (Maycock and Graves 2001). Magpies feeding on treated eggs decreased after a short period of time, however, their feeding behavior switched to pecking holes in eggs, possibly trying to detect treated eggs before consuming them. This behavior may suggest that at least some magpies experienced the ill effects of Mesurol, but the "tasting" of eggs may result in increased predation (Maycock and Graves 2001).

APPENDIX D

WILDLIFE SERVICES TAKE DATA BY COUNTY

Table 1a. Total number of predators Killed/Freed by County by WS-Idaho during Fiscal Years 2010 – 2015. Table includes all WS-Idaho operational take for target species addressed in this EA including non-target take associated with this and other WS-Idaho projects (e.g., USDA 2012). Animals marked as freed may be target animals that were relocated, target animals captured for research (e.g., radio collar) or disease surveillance and released on site and non-target animals released on site.

County Name (acreage)	Fate of Animal*	Badger	Bear, Black	Bear, Grizzly	Bobcat	Cat, Feral	Coyote	Dog, Feral	Fox, Red	Lion
Ada (675,200)	Killed	1				1	328		7	
	Freed					4	4			
Adams (873,408)	Killed	12	4		3	1	225		11	
	Freed								3	
Bannock (712,448)	Killed						88	1	10	
	Freed									
Bear Lake (621,696)	Killed	28			1		331		7	1
	Freed							1		
Benewah (496,640)	Killed						104			1
	Freed				1					
Bingham (1,340,672)	Killed	5				2	554	6	8	
	Freed	1				4		1		
Blaine (1,692,736)	Killed	5	8				1,182		7	
	Freed		2							1
Boise (1,217,600)	Killed		3				56		6	4
	Freed					1		1		
Bonner (1,112,064)	Killed	1	2				331	10		3
	Freed				1					
Bonneville (1,195,904)	Killed	5	2		1		223	10	1	
	Freed									
Boundary (812,032)	Killed						199			6
	Freed									

County Name (acreage)	Fate of Animal*	Mink	Otter	Raccoon	Raven, Common	Skunk, Spotted	Skunk, Striped
Ada (675,200)	Killed			26	43		10
	Freed						1
Adams (873,408)	Killed			6	20		32
	Freed						
Bannock (712,448)	Killed						2
	Freed						
Bear Lake (621,696)	Killed			31	49		11
	Freed						
Benewah (496,640)	Killed						
	Freed						
Bingham (1,340,672)	Killed		1	8			2
	Freed			1			1
Blaine (1,692,736)	Killed			1			10
	Freed						
Boise (1,217,600)	Killed			1			
	Freed						
Bonner (1,112,064)	Killed			7	45		
	Freed						
Bonneville (1,195,904)	Killed						1
	Freed						
Boundary (812,032)	Killed				50		
	Freed						

Table 1b. Predators Killed/Freed by County by WS-Idaho during Fiscal Years 2010 – 2015 (Continued).

County Name (acreage)	Fate of Animal*	Badger	Bear, Black	Bear, Grizzly	Bobcat	Cat, Feral	Coyote	Dog, Feral	Fox, Red	Lion
Butte (1,429,056)	Killed	2					410			
	Freed		1							
Camas (688,00)	Killed		5				188		4	
	Freed		1							
Canyon (377,472)	Killed						125	1	10	
	Freed					1				
Caribou (1,130,304)	Killed	4					839		2	6
	Freed	1						1		
Cassia (1,642,624)	Killed	15			1		1,204	18	6	
	Freed	11						2		
Clark (1,129,408)	Killed		1		1		407	2	25	
	Freed							4		
Clearwater (1,575,424)	Killed						61			
	Freed				1					
Custer (3,152,384)	Killed	2	3		1		290		8	
	Freed		7						1	
Elmore (1,969,792)	Killed		5				699		4	1
	Freed						5	1		1
Franklin (425,920)	Killed						139			
	Freed									
Fremont (1,194,752)	Killed	7					198	1	10	
	Freed		6	4				2		
Gem (360,064)	Killed	6	1				618	1	3	
	Freed	1						2		
Gooding (467,712)	Killed						1,010		2	
	Freed									

County Name (acreage)	Fate of Animal*	Mink	Otter	Raccoon	Raven, Common	Skunk, Spotted	Skunk, Striped
Butte (1,429,056)	Killed						1
	Freed						
Camas (688,00)	Killed						
	Freed						
Canyon (377,472)	Killed			1			8
	Freed						
Caribou (1,130,304)	Killed			15	50		3
	Freed						
Cassia (1,642,624)	Killed	1		4	179	3	19
	Freed						
Clark (1,129,408)	Killed				3		
	Freed						
Clearwater (1,575,424)	Killed						1
	Freed						
Custer (3,152,384)	Killed						3
	Freed						
Elmore (1,969,792)	Killed				30		
	Freed						
Franklin (425,920)	Killed			9	35		6
	Freed						
Fremont (1,194,752)	Killed						
	Freed						
Gem (360,064)	Killed		1	2			2
	Freed						
Gooding (467,712)	Killed			1	20		4
	Freed						

Table 1c. Predators Killed/Freed by County by WS-Idaho during Fiscal Years 2010 – 2015 (continued).

County Name (acreage)	Fate of Animal*	Badger	Bear, Black	Bear, Grizzly	Bobcat	Cat, Feral	Coyote	Dog, Feral	Fox, Red	Lion
Idaho (5,430,528)	Killed		3		3		358			3
	Freed		5		1					
Jefferson (700,864)	Killed						344		8	
	Freed							2		
Jerome (383,936)	Killed						501	1	2	
	Freed									
Kootenai (796,928)	Killed		1				205			
	Freed									
Latah (689,088)	Killed						169			
	Freed									
Lemhi (2,921,152)	Killed	6	1				331		1	
	Freed		2		1	1				
Lewis (306,624)	Killed						81			
	Freed									
Lincoln (771,584)	Killed						1,128			
	Freed									
Madison (301,824)	Killed						1			
	Freed									
Minidoka (486,208)	Killed						711	1	8	
	Freed								1	
Nez Perce (543,424)	Killed						127			
	Freed									
Oneida (768,256)	Killed									
	Freed									
Owyhee (4,914,176)	Killed									
	Freed									

County Name (acreage)	Fate of Animal*	Mink	Otter	Raccoon	Raven, Common	Skunk, Spotted	Skunk, Striped
Idaho (5,430,528)	Killed				65		
	Freed			1			
Jefferson (700,864)	Killed				5		
	Freed						
Jerome (383,936)	Killed						1
	Freed						
Kootenai (796,928)	Killed			2			
	Freed						
Latah (689,088)	Killed			1	22		
	Freed						
Lemhi (2,921,152)	Killed						
	Freed						
Lewis (306,624)	Killed						
	Freed						
Lincoln (771,584)	Killed				25		
	Freed						
Madison (301,824)	Killed						
	Freed						
Minidoka (486,208)	Killed			2			10
	Freed						
Nez Perce (543,424)	Killed				26		
	Freed						
	Killed			1	50		6
	Freed						
	Killed			1	44		
	Freed						

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Table 1d. Predators Killed/Freed by County by WS-Idaho during Fiscal Years 2010 – 2015 (continued).

County Name (acreage)	Fate of Animal*	Badger	Bear, Black	Bear, Grizzly	Bobcat	Cat, Feral	Coyote	Dog, Feral	Fox, Red	Lion
Oneida (768,256)	Killed	1					118			
	Freed	1								
Owyhee (4,914,176)	Killed						1,788			
	Freed									
Payette (260,800)	Killed					2	541		3	
	Freed									
Power (899,648)	Killed	12				1	314		6	
	Freed	2								
Shoshone (1,685,760)	Killed				1					1
	Freed									
Teton (288,256)	Killed		4	1			30		1	
	Freed							1		
Twin Falls (1,232,064	Killed	8	1		1		1,163	9	9	
	Freed	4				1		4		
Valley (2,354,048)	Killed	1	2				141		5	1
	Freed		3		1					
Washington (932,096)	Killed	7	1		1	1	1,462		23	1
	Freed									
Totals by Species	Killed	128	47	1	14	8	19,322	61	197	28
	Freed	21	27	4	6	12	9	22	5	2
Annual Avg. by Species	Killed	21	8	0.2	2	1	3,220	10	33	5
	Freed	4	4	0.7	1	2	2	4	0.8	0.3

County Name (acreage)	Fate of Animal*	Mink	Otter	Raccoon	Raven, Common	Skunk, Spotted	Skunk, Striped
Payette (260,800)	Killed			7			2
	Freed						
Power (899,648)	Killed			23	40		2
	Freed						
Shoshone (1,685,760)	Killed						
	Freed						
Teton (288,256)	Killed						
	Freed						
Twin Falls (1,232,064	Killed		1	5			9
	Freed						
Valley (2,354,048)	Killed						
	Freed						
Washington (932,096)	Killed			2	90		17
	Freed			1			
Total	**Killed**	**1**	**3**	**156**	**891**	**3**	**162**
	Freed	**-**	**-**	**3**	**-**	**-**	**2**
Annual Average	**Killed**	**0.2**	**0.5**	**26**	**148**	**0.5**	**27**
	Freed			**0.5**			**0.3**

APPENDIX E

SUMMARY OF RELATIONSHIPS AMONG AGENCY AUTHORITIES AND DECISION-MAKING PROCESSES

Table E.1. Authority and interactions among of agencies and tribes in PDM.

Management Entity Lands Directly Managed	Role on Lands Directly Managed by the Entity	Role on Other Lands
U.S. Forest Service		
National Forests (NF) WAs within NF WSAs within NF ACEC within NF	Regulates and manages livestock grazing permits and permittees in accordance with applicable management plans, policies and Congressional direction. Informs WS of regulations, agency policy, and management plans and any associated restrictions on PDM actions applicable to potential project areas. Informs WS of the location of sensitive species, historic resources, special activities, high intensity recreation areas and other factors which may be impacted by PDM and works with WS to identify methods to eliminate or minimize potential for adverse impacts. This includes informing WS of regulations, restrictions and policies applicable to Wilderness Areas (WAs), Wilderness Study Areas (WSAs), Areas of Critical Environmental Concern (ACECs) and other sensitive sites. Works with WS in preparation of NEPA analyses to ensure USFS issues and concerns are adequately addressed. HH&S issues are handled by the IDFG under an interagency MOU. The USFS consults with tribes to identify and address concerns regarding tribal historic and cultural resources and to work with tribes to meet federal trust and treaty responsibilities within the ceded territories including the right to hunt or gather culturally significant species on open and unclaimed lands-for subsistence, cultural, religious, and economic purposes. Coordinates with IDFG regarding management of wildlife on NF lands. Includes conducting applicable reviews and providing appropriate authorizations for select actions proposed for SMAs such as WAs and WSAs.	
Bureau of Land Management		
BLM Lands WAs within BLM WSAs within BLM ACEC within BLM	Regulates and manages livestock grazing permits and permittees in accordance with applicable management plans, policies and Congressional direction. Informs WS of regulations, agency policy, and management plans and any associated restrictions on PDM actions applicable to potential project areas. Informs WS of the location of sensitive species, historic resources, special activities, high intensity recreation areas and other factors which may be impacted by PDM and works with WS to identify methods to eliminate or minimize potential for adverse impacts. This includes informing WS of regulations, restrictions and policies applicable to Wilderness Areas (WAs), Wilderness Study Areas (WSAs), Areas of Critical Environmental Concern (ACECs) and other sensitive sites. Works with WS in preparation of NEPA analyses to ensure USFS issues and concerns are adequately addressed.	

	The BLM consults with tribes to identify and address concerns regarding tribal historic and cultural resources and to work with tribes to meet federal trust and treaty responsibilities within the ceded territories including the right to hunt or gather culturally significant species on open and unclaimed lands-for subsistence, cultural, religious, and economic purposes. Coordinates with IDFG regarding management of wildlife on NF lands. Includes conducting applicable reviews and providing appropriate authorizations for select actions proposed for SMAs such as WAs and WSAs.	
National Park Service		
National Parks National Monuments Historic Preservation Areas	Regulates and manages National Parks for the protection and conservation of lands for wildlife and recreational uses. Responsible for wildlife management on lands under their jurisdiction. Collaborates with state and tribe to maintain viable wildlife populations and ecosystems. Authorizes WS-Idaho PDM actions on NPS lands. Informs WS of regulations, agency policy, and management plans and any associated restrictions on PDM actions applicable to potential project areas. Informs WS of the location of sensitive species, historic resources, special activities, high intensity recreation areas and other factors which may be impacted by PDM and works with WS to identify methods to eliminate or minimize potential for adverse impacts. The NPS consults with tribes to identify and address tribal concerns regarding tribal historic and cultural resources and to work with tribes to meet federal trust and treaty responsibilities within the ceded territories including the right to hunt or gather culturally significant species on open and unclaimed lands—for subsistence, cultural, religious, and economic purposes.	
U.S. Fish & Wildlife Service		
National Wildlife Refuges	Regulates and manages USFWS Refuges for the protection and enhancement of habitat used by wildlife. Responsible for wildlife management on lands under their jurisdiction. Collaborates with state and tribe to maintain viable wildlife populations and ecosystems. Authorizes WS-Idaho PDM actions on USFWS lands. Informs WS of regulations, agency policy, and management plans and any associated restrictions on PDM actions applicable to potential project areas. Informs WS of the location of sensitive species, historic resources, special activities, high intensity recreation areas and other factors which may be impacted by PDM and works with WS to identify methods to eliminate or minimize potential for adverse impacts. Works with WS in preparation of NEPA analyses to ensure USFWS issues and concerns are adequately addressed. Consults with WS-Idaho regarding potential risks to species listed under the ESA from PDM methods used by WS-Idaho. May restrict tools that may be utilized within certain	

	areas where T/E species may be present. Reviews and authorizes take of migratory birds including eagles and monitors cumulative impacts on migratory bird populations. The USFWS consults with tribes to identify and address tribal concerns regarding tribal historic and cultural resources and to work with tribes to meet federal trust and treaty responsibilities within the ceded territories including the right to hunt or gather culturally significant species on open and unclaimed lands—for subsistence, cultural, religious, and economic purposes. The NPS consults with tribes to identify and address tribal concerns regarding tribal historic and cultural resources and to work with tribes to meet federal trust and treaty responsibilities within the ceded territories including the right to hunt or gather culturally significant species on open and unclaimed lands—for subsistence, cultural, religious, and economic purposes.	
State Agencies		
State Parks State Forests	Establishes and enforces regulations and management plans for state-managed species, including those which are on State lands. Includes establishment and monitoring of hunting and trapping regulations and regulations governing wildlife damage management in the state. May request assistance for the protection of resources under their responsibilities (e.g., wildlife) to resolve specific PDM issues on public lands, State or federal. For PDM projects requested by the IDFG involving the protection of wildlife in Idaho, IDFG establishes the need for action, project goals, control strategies to be utilized and provide State funding that will support these projects.	Establishes and enforces regulations and management plans for State-managed species, including those which are on other lands, except USFWS and NPS lands. Coordinates with USFWS and NPS on management of species of mutual concern. Includes establishment and monitoring of hunting and trapping regulations and regulations governing wildlife damage management in the State. May request assistance for the protection of resources under their responsibilities (e.g., wildlife) to resolve specific PDM issues on federal lands (e.g., USFS, BLM). For PDM projects requested by the IDFG involving the protection of wildlife in Idaho, IDFG establishes the need for action, project goals, control strategies to be utilized and provides State funding to support these projects.
Tribes		
Ceded Territory Reservations	Tribal members may request assistance with PDM from WS on tribal lands. Tribal members may place restrictions on what species of animal may be targeted by WS-Idaho and which methods may be used to resolve their conflict with predators. Informs WS of practices needed to preserve cultural and history resources, human health and safety and species of special concern to the tribe.	At a tribe's request, WS-Idaho also consults with and provides reports to the tribe to address concerns regarding WS-Idaho PDM actions on USFS, BLM, USFWS and NPS lands within the ceded territories. Coordinates with WS, and state and federal land management agencies regarding wildlife management actions within the ceded territories and lands adjacent to tribal lands. Consults with federal agencies and state on ways to minimize risks to tribal historic and cultural sites.
Livestock Producers		
Private Property	Private landowners may request assistance with PDM services from WS-Idaho. Landowners may place restrictions on what species of animal may be targeted by WS-Idaho and which methods may be used to resolve their conflict with predators.	Where livestock producers maintain or hold leases or grazing allotments, livestock producers may request assistance with PDM services from WS-Idaho. These producers may place restrictions on what species of animal may be targeted by WS-Idaho and which methods may be used to resolve their conflict with predators.
ID State Animal Damage Control Board		

None	Not applicable.	The Board allocates funds to WS-Idaho that were collected from the Counties for specific types of PDM actions. The Boards may restrict how their funds may be used by WS-Idaho in PDM projects within their area of authority (e.g., types of methods/strategies may be used, which species may be controlled and what land class that may be worked upon by WS-Idaho).
Local Governments		
City Property County Property	City and County authorities may request assistance with PDM from WS. City and County authorities may place restrictions on what species of animal may be targeted by WS-Idaho and which methods may be used to resolve their conflict with predators.	None.

APPENDIX F

POTENTIAL IMPACT AND CONCLUSION MATRIX FROM 2016 WS BIOLOGICAL ASSESSMENT ON POTENTIAL IMPACTS OF ALL WS-IDAHO OPERATIONAL ACTIVITIES ON FEDERALLY-LISTED SPECIES (USDA 2016)

	Class -->	Mammals				Birds	Invertebrates			
Methods and Tools	Method	Grizzly Bear	S. Selkirk Mtns. Caribou	Canada Lynx	N. Idaho Ground Squirrel	Yellow-billed Cuckoo	Banbury Spring Limpet	Bliss Rapids Snail	Snake River Physa Snail	Bruneau Hot Springsnail
Capture Devices	Small Cage Trap	NE-1	NE-1	NE-1	NLAA, BE	NE-1	NE-1,2	NE-1,2	NE-1,2	NE-1,2
	Culvert and Large Cage Trap	LAA	NE-1	NLAA	NE-1,2	NE-1	NE-1,2	NE-1,2	NE-1,2	NE-1,2
	Avian Cage Trap	NE-1	NE-1	NE-1	NE-1	NE-1,3	NE-1	NE-1	NE-1	NE-1
	Corral Trap	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1
	Quick-kill/body-griping Trap	NE-1	NE-1	NE-2,3	NE-3	NE-1,2	NE-1	NE-1	NE-1	NE-1
	Basket-Type Trap	NE-1,2	NE-1,2	NE-1,2	NE-1,2	NE-1,	NE-1	NE-1	NE-1	NE-1
	Foothold Trap	LAA	NLAA, BE	LAA, BE	NLAA, BE	NE-1,2	NE-1,2	NE-1,2	NE-1,2	NE-1,2
	Foot Snare	LAA	NLAA, BE	LAA, BE	NE-1	NE-1,2,3	NE-1,2,3	NE-1,2,3	NE-1,2,3	NE-1,2,3
	Padded-Jaw Pole Trap	NE-1,2	NE-1,2	NE-1,2	NE-1,2	NE-1	NE-1,2	NE-1,2	NE-1,2	NE-1,2
	Raptor Trap	NE-1,2	NE-1,2	NE-1,2	NE-1,2	NE-1	NE-1,2	NE-1,2	NE-1,2	NE-1,2
	Snares (neck and body)	NLAA	NLAA	LAA	NE-1,2	NE-1,2	NE-1,2	NE-1,2	NE-1,2	NE-1,2
	Glue Board or Tray	NE-1,2	NE-2	NE-2	NE-2,3	NE-1	NE-1	NE-1	NE-1	NE-1
	Cannon and Rocket Net	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1
	Net Gun	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1
	Mist Net	NE-1,2	NE-1,2	NE-1,2	NE-1,2	NE-1, 3	NE-1,2	NE-1,2	NE-1,2	NE-1,2
	Bow Net	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1
	Hand Net	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1
Chemical - Damage Management Methods	DRC-1339	NE-1,3	NE-1,3	NE-1,3	NE-1,3	NE-1	NE-1,3	NE-1,3	NE-1,3	NE-1,3
	Zinc Phosphide	NE-3	NE-1	NE-3	NLAA	NE-1	NE-1	NE-1	NE-1	NE-1
	Avitrol	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1
	Compound 1080	NLAA	NE-1	NE-1,3	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1
	Gas Cartridges (rodent and denning)	NE-1	NE-1	NE-1	NLAA, BE	NE-1	NE-1	NE-1	NE-1	NE-1
	Aluminum Phosphide	NE-3	NE-1	NE-3	NLAA, BE	NE-1	NE-1	NE-1	NE-1	NE-1
	M-44 Sodium Cyanide	NLAA	NE-1	NE-3	NLAA, BE	NE-1	NE-1	NE-1	NE-1	NE-1
	Anticoagulant	NE-1,3	NE-1,3	NE-1,3	NE-3	NE-1	NE-1,3	NE-1,3	NE-1,3	NE-1,3
	Strychnine	NE-5	NE-3,5	NE-3	NE-5	NE-1	NE-1	NE-1	NE-1	NE-1
Chemical Animal Handling	Alpha-chorolose	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1
	Ketamine/Xylazine and Telazol	NE-4	NE-1	NLAA, BE	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1
	Tranquilizer Trap Device	NE-3	NE-1	NE-3	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1
	Euthanasia.	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1
Beaver Dam Removal	Beaver Dam Breaching - Explosives	NE-1	NE-1	NE-1	NE-1	NLAA, BE	NE-3	NE-3	NE-3	NE-3
	Beaver Dam Breaching - Hand Tools	NE-1	NE-1	NE-1	NE-1	NLAA, BE	NE-3	NE-3	NE-3	NE-3
	Water-level Control Device	NE-1	NE-1	NE-1	NE-1	NE-1,2	NE-3	NE-3	NE-3	NE-3
Hazing-Exclusion	Propane Exploder	NLAA, BE	NE-3	NLAA	NLAA	NE-1	NE-1,3	NE-1	NE-1,3	NE-1,3
	Pyrotechnic	NLAA, BE	NE-3	NLAA	NE-3	NE-1	NE-1	NE-1,3	NE-1,3	NE-1,3
	Laser and Strobe Light	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1
	Physical Harassment by Radio Controlled Boat	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1
	Other Scaring Devices (alarm calls, effigies, etc.)	NLAA, BE	NE-3	NLAA	NE-3	NE-1	NE-1	NE-1	NE-1	NE-1
	Electric/Temporary Fencing	NLAA, BE	NE-3	NE-3	NE-3	NE-1	NE-1	NE-1,3	NE-1	NE-1
	Sheathing and Tree Protector	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1
	Barriers, Netting, Wire Grid and other Exclusion Methods	NE-3	NE-3	NE-3	NE-3	NE-1	NE-1	NE-1	NE-1	NE-1
	Abrasives	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1
Aerial	Aerial Shooting	NLAA	NE-3	NLAA	NE-2	NE-3	NE-3	NE-3	NE-3	NE-3
	Aerial Telemetry-Surveillance	NLAA	NE-1	NLAA	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1
	Aerial Hazing	NE-3	NE-3	NE-3	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1
Miscellaneous	Ground Shooting	NLAA	NLAA, BE	NLAA, BE	NLAA, BE	NE-2	NE-3	NE-3	NE-3	NE-3
	Calling (mouth and electronic)	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1
	Egg, Nest and Hatchling Removal and Destruction	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1
	Trained Dog	NLAA	NE-1	NLAA, BE	NLAA, BE	NE-1	NE-1,3	NE-1,3	NE-1,3	NE-1,3
	Site Access (pick-up truck, ATV, etc.)	NLAA	NLAA	NLAA	NLAA	NLAA	NE-3	NE-3	NE-3	NE-3

NE-1 denotes no effect to associated species due to trap design, tool and/or technique.
NE-2 denotes no effect to associated species due to location of trap
NE-3 denotes no effect to associated species due to no use in species occupied area.
NE-4 denotes no effect to associated species as WS is not lead Agency
NE-5 denotes no effect to associated species when label directions are followed
BE- denotes beneficial effect associated with species.
NLAA - Not Likely to Adversely Affect
LAA - Likely to Adversely Affect

Candidate species
Proposed species

	Class -->	Fish					Plants					
Methods and Tools	Method	Bull Trout	Chinook Salmon	Sockeye Salmon	Steelhead	White Sturgeon (Kootenai)	Spalding's Catchfly	Mac-Farlane's Four-o'clock	Water Howellia	Ute Ladies'-tresses	Slickspot Pepper-grass	Whitebark Pine
Capture Devices	Small Cage Trap	NE-2	NE-1,2,3	NE-1,2,3	NE-1,2,3	NE-1,2,3	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1
	Culvert and Large Cage Trap	NE-1,2	NE-1,2,3	NE-1,2,3	NE-1,2,3	NE-1,2,3	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1
	Avian Cage Trap	NE-2	NE-1,2,3	NE-1,2,3	NE-1,2,3	NE-1,2,3	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1
	Corral Trap	NE-1	NE-1,2,3	NE-1,2,3	NE-1,2,3	NE-1,2,3	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1
	Quick-kill/body-griping Trap	NLAA, BE	NE-2,3	NE-2,3	NE-2,3	NE-2,3	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1
	Basket-Type Trap	NE-3	NE-3	NE-3	NE-3	NE-2,3	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1
	Foothold Trap	NE-1,2	NE-1,2	NE-1,2	NE-1,2	NE-1,2,3	NE-3	NE-3	NE-3	NE-3	NE-3	NE-1
	Foot Snare	NE-1,2,3	NE-1,2,3	NE-1,2,3	NE-1,2,3	NE-1,2,3	NE-1,2,3	NE-1,2,3	NE-1,2,3	NE-1,2,3	NE-1,2,3	NE-1,2
	Padded-Jaw Pole Trap	NE-1,2	NE-1	NE-1	NE-1	NE-1	NE-1,2	NE-1,2	NE-1,2	NE-1,2	NE-1,2	NE-1
	Raptor Trap	NE-1,2	NE-1	NE-1	NE-1	NE-1	NE-1,2	NE-1,2	NE-1,2	NE-1,2	NE-1,2	NE-1
	Snares (neck and body)	NE-1,2	NE-1,2	NE-1,2	NE-1,2	NE-1,2,3	NE-3	NE-3	NE-3	NE-3	NE-3	NE-1
	Glue Board or Tray	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1
	Cannon and Rocket Net	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1
	Net Gun	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1
	Mist Net	NE-1,2	NE-1	NE-1	NE-1	NE-1	NE-1,2	NE-1,2	NE-1,2	NE-1,2	NE-1,2	NE-1
	Bow Net	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1
	Hand Net	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1
Chemical - Damage Management Methods	DRC-1339	NE-1,5	NE-1,5	NE-1,5	NE-1,5	NE-1,5	NE-1,3	NE-1,3	NE-1,3	NE-1,3	NE-1,3	NE-1
	Zinc Phosphide	NE-1,5	NE-1,5	NE-1,5	NE-1,5	NE-1,5	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1
	Avitrol	NE-1,5	NE-1,5	NE-1,5	NE-1,5	NE-1,5	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1
	Compound 1080	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1
	Gas Cartridges (rodent and denning)	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1
	Aluminum Phosphide	NE-1,5	NE-1,5	NE-1,5	NE-1,5	NE-1,5	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1
	M-44 Sodium Cyanide	NE-1,5	NE-1,5	NE-1,5	NE-1,5	NE-1,5	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1
	Anticoagulant	NE-1,5	NE-1,5	NE-1,5	NE-1,5	NE-1,5	NE-1,3	NE-1,3	NE-1,3	NE-1,3	NE-1,3	NE-1
	Strychnine	NE-1,5	NE-1,5	NE-1,5	NE-1,5	NE-1,5	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1
Chemical Animal Handling	Alpha-chorolose	NE-1,5	NE-1,5	NE-1,5	NE-1,5	NE-1,5	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1
	Ketamine/Xylazine and Telazol	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1
	Tranquilizer Trap Device	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1
	Euthanasia	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1
Beaver Dam Removal	Beaver Dam Breaching - Explosives	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1
	Beaver Dam Breaching - Hand Tools	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1
	Water-level Control Device	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1
Hazing-Exclusion	Propane Exploder	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1
	Pyrotechnic	NE-1,3	NE-1,3	NE-1,3	NE-1,3	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1
	Laser and Strobe Light	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1
	Physical Harassment by Radio Controlled Boat	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1
	Other Scaring Devices (alarm calls, effigies, etc.)	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1
	Electric/Temporary Fencing	NE-1	NE-1,3	NE-1,3	NE-1,3	NE-1	NE-1,3	NE-1,3	NE-1,3	NE-1,3	NE-1,3	NE-1
	Sheathing and Tree Protector	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1
	Barriers, Netting, Wire Grid and other Exclusion Methods	NE-1,3	NE-1,3	NE-1,3	NE-1,3	NE-1	NE-1,3	NE-1,3	NE-1,3	NE-1,3	NE-1,3	NE-1,3
	Abrasives	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1
Aerial	Aerial Shooting	NE-3	NE-3	NE-3	NE-3	NE-3	NE-3	NE-1	NE-1	NE-1	NE-1	NE-1
	Aerial Telemetry-Surveillance	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1
	Aerial Hazing	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1
Miscellaneous	Ground Shooting	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1
	Calling (mouth and electronic)	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1
	Egg, Nest and Hatchling Removal and Destruction	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1
	Trained Dog	NE-1,3	NE-1,3	NE-1,3	NE-1,3	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1
	Site Access (pick-up truck, ATV, etc.)	NE-1,3	NE-1,3	NE-1,3	NE-1,3	NE-1,3	NE-1	NE-1	NE-1	NE-1	NE-1	NE-1

NE-1 denotes no effect to associated species due to trap design, tool and/or technique.
NE-2 denotes no effect to associated species due to location of trap
NE-3 denotes no effect to associated species due to no use in species occupied area.
NE-4 denotes no effect to associated species as WS is not lead Agency
NE-5 denotes no effect to associated species when label directions are followed
BE- denotes beneficial effect associated with species.
NLAA - Not Likely to Adversely Affect
LAA - Likely to Adversely Affect

Candidate species
Proposed species

APPENDIX G

RESPONSE TO 2016 EVALUATION OF PREDATOR CONTROL STUDIES BY DR. ADRIAN TREVES, MIHA KROFEL AND JEANNINE MCMANUS

On September 1, 2016, researchers from the University of Wisconsin-Madison*, University of Ljubljana, and University of Witwatersrand released a publication entitled "Predator control should not be a shot in the dark" (Treves et al. 2016). The researchers evaluated 12 existing publications (5 non-lethal and 7 lethal methods) regarding the effectiveness of nonlethal and lethal methods for reducing predation on livestock. Their main conclusions included the following:

1. 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)
2. 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
3. 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
4. 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
5. 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 Treves' Article:

- 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 impact results. This is the inherent nature of field work.
    - 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. Wildlife Services researchers 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.

- Treves et al.'s sloppy assessment of existing predation studies from North America and Europe causes us to question his ability to accurately critique the scientific literature. Treves et al.'s critique of a least two of the studies reviewed in their paper did not accurately interpret or represent the studies' designs and results.
  - 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-44s - also a dependent variable) during the subsequent summer. Treves et al. (2016) mistakenly characterize use of traps, snares and M-44s 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-44s; 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-44s 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, Treves et al.'s 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 move 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) states the study includes a reporting bias because "data was not presented" on livestock-guarding dogs. Wagner and Conover (1999) clearly states that one of the criterion used for pairing allotments was the presence or absence of livestock guarding dogs (LGD). They did not pair allotments with LGDs with allotments without LGDs. Failure to provide data showing that that number of treated allotments with LGDs matched the number of untreated allotments with LGDs does not constitute a reporting bias.

o Treves et al. (2016) misrepresents another study conducted by Dr. Eric Gese (WS-NWRC) and a Utah State University collaborator on a study site in northeastern Utah. Treves et al. (2016) confuses two different studies when citing Bromley and Gese (2009) on page 23. The Bromley and Gese (2001a, 2001b) study examined coyote predation on domestic sheep; in contrast, the Seidler and Gese (2012) study examined coyote predation on pronghorn antelope fawns. While citing Bromley and Gese (2009), Treves et al. (2016) is actually referring to a paper published in 2001 (Bromley and Gese 2001a). As a reason for study bias, they mention that Bromley and Gese's study includes a high overlap between coyote territories. The statistics mentioned actually come from a completely different study (Seidler and Gese 2012) that was conducted in a different state (southeastern Colorado), 7 years later, and in a completely different system (i.e., no sheep). The Bromley and Gese (2001b) publication actually reports that coyote core areas overlapped only once (by 3%) and there was no significant difference in overlap among sterile and intact coyote packs. In fact, to eliminate a potential inaccurate assignment of the coyotes responsible for making a kill, Bromley and Gese used the actual locations of the radioed coyotes as the method of assigning which pack killed the sheep whenever there was overlap of territory boundaries between adjacent packs.

Additionally, Treves et al. (2016) incorrectly states that the estimates of weekly survival rates are not biologically significant. However, they used data from all the packs which is inappropriate as not all packs killed sheep. By only using data from sheep-killing packs and doing some simple math, they would have concluded that a weekly survival rate of 0.997 in the sterile packs equates to 94% of the lambs surviving for the next 6-months (beyond which they are no longer vulnerable to predation), versus a weekly survival rate of 0.985 in the intact packs which equates to 72% of the lambs surviving for the next 6 months. Therefore, sterilization would provide 22% higher survival of lambs which is quite biologically and economically significant to a livestock producer.

The correct references are:

- Bromley, C., and E. M. Gese. 2001a. Surgical sterilization as a method of reducing coyote predation on domestic sheep. Journal of Wildlife Management 65(3):510-519.

- Bromley, C., and E. M. Gese. 2001b. Effects of sterilization on territory fidelity and maintenance, pair bonds, and survival rates of free-ranging coyotes. Canadian Journal of Zoology 79(3):386-392.

- Treves et al. (2016) include a paper by (Musiani et al. 2003) whereby they claim fladry (a method for controlling wolves) was experimentally tested. But in fact the experimental portion of the work was done on captive animals. The two field trials included in the paper did not meet the scientific standards outlined by Treves. This was either purposefully deceptive or sloppy.

- Treves et al. (2016) selectively disregards studies from Australia. These 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 odd that they would purposefully 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 cannot be controlled and assumptions that must be acknowledged when trying to answer complex ecological questions. We do 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 National Environmental Policy Act (NEPA) requires federal agencies to evaluate environmental impacts into their decision making processes and ensures that environmental information is available to public officials and citizens before decisions are made and actions are taken. To fulfill this responsibility, Wildlife Services 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 can be found in the program's Environmental Assessments and Environmental Impacts Statements which are available by state on the APHIS website.

Wildlife Services encourages the use of nonlethal predation damage management tools and techniques when feasible and practical, however, not all wildlife damage problems can be resolved using nonlethal techniques alone. Even with the use of single or combined nonlethal methods, livestock losses to predators often continue. When conducting lethal management activities, Wildlife Services 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 (TWS), whose 10,000 members include scientists, managers, educators and others, have long supported the use of lethal take. TWS's Standing Position Statement 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." It is important to note that Wildlife Services is tasked with reducing wildlife damage. We do not manage wildlife populations. The management of predators and other wildlife is the responsibility of the states and other federal agencies. As such, any actions undertaken to reduce wildlife damage are conducted in collaboration with state agencies and under appropriate state and federal permits and laws.