Pre-Decisional

ENVIRONMENTAL ASSESSMENT (EA)
for
PREDATOR DAMAGE MANAGEMENT IN EASTERN WYOMING

including the counties of
Albany, Campbell, Crook, Goshen, Johnson, Natrona,
Niobrara, Sheridan, and Weston

Prepared by:

UNITED STATES DEPARTMENT OF AGRICULTURE (USDA)
ANIMAL AND PLANT HEALTH INSPECTION SERVICE (APHIS)
WILDLIFE SERVICES (WS)

In Cooperation With:

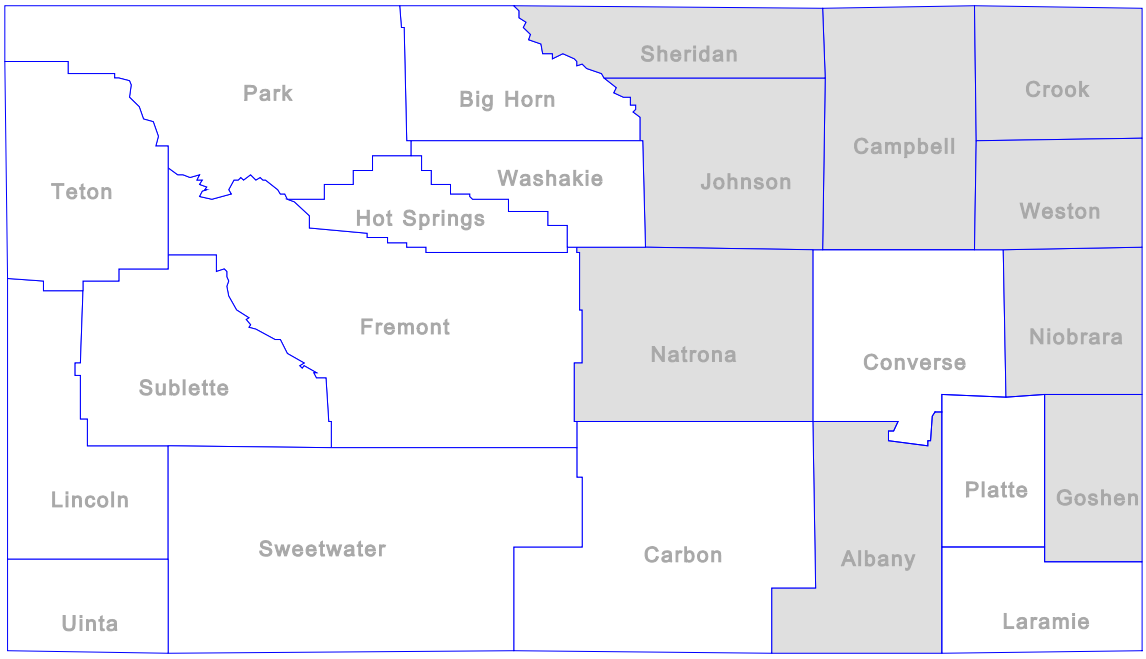
UNITED STATES DEPARTMENT OF AGRICULTURE
U.S. FOREST SERVICE
Bighorn National Forest
Medicine Bow National Forest
(including Thunder Basin National Grassland)
Black Hills National Forest

UNITED STATES DEPARTMENT OF INTERIOR
BUREAU OF LAND MANAGEMENT (BLM)
Casper District
Rawlins District

WYOMING GAME AND FISH DEPARTMENT (WGFD)

WYOMING DEPARTMENT OF AGRICULTURE (WDA)

WYOMING STATE LANDS AND INVESTMENTS (WSLI)


Sheridan
Park
Big Horn
Crook
Campbell
Teton
Washakie
Johnson
Weston
Hot Springs
Fremont
Natrona
Converse
Niobrara
Sublette
Platte
Goshen
Lincoln
Sweetwater
Carbon
Albany
Uinta
Laramie

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ACRONYMS

ACEC	Area of Critical Environmental Concern
ADM	Animal Damage Management
APHIS	Animal and Plant Health Inspection Service
AVMA	American Veterinary Medical Association
BLM	Bureau of Land Management
CDFG	California Department of Fish and Game
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
DEQ	Department of Environmental quality
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FDA	Food and Drug Administration
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FLPMA	Federal Land Management and Policy Act
FONSI	Finding of No Significant Impact
FY	Fiscal Year
GAO	U.S. General Accounting Office
HSUS	Humane Society of the United States
IDFG	Idaho Department of Fish & Game
IGBC	Interagency Grizzly Bear Committee
IWDM	Integrated Wildlife Damage Management
LPC	Livestock Protection Collar
LRMP	Land and Resource Management Plans
MIS	Management Information System
MFWP	Montana Department of Fish, Wildlife and Parks
MOU	Memorandum of Understanding
NADA	New Animal Drug Application
NASS	National Agricultural Statistical Service
NEPA	National Environmental Policy Act
NF	National Forest
NFMA	National Forest Management Act
NHPA	National Historical Preservation Act
NPS	National Park Service
ODFW	Oregon Department of Fish and Wildlife
PA	Primitive Area
PETA	People for the Ethical Treatment of Animals
PMZ	Primary Management Zone
RMP	Resource Management Plan
RNA	Research Natural Areas
ROD	Record of Decision
SHPO	State Historic Preservation Office
SOP	Standard Operating Procedure
T&E	Threatened and Endangered Species
USDA	U.S. Department of Agriculture
USDI	U.S. Department of Interior
USFWS	U.S. Fish and Wildlife Service
WA	Wilderness Area
WAS	Wyoming Agricultural Statistics
WDA	Wyoming Department of Agriculture
WGFD	Wyoming Game and Fish Department
WS	Wildlife Services
WSA	Wilderness Study Area
WSLI	Wyoming State Lands and Investments
WSR	Wild and Scenic River
WSS	Wyoming State Statutes

CHAPTER 1: PURPOSE OF AND NEED FOR ACTION

1.0 INTRODUCTION

Across the United States, wildlife habitat has been substantially changed as human populations expand and land is used for human needs. These human uses and needs often compete with wildlife which increases the potential for conflicting human-wildlife interactions. In addition, segments of the public strive for protection for all wildlife; this protection can create localized conflicts between human and wildlife activities. The *Animal Damage Control Program Final Environmental Impact Statement* (EIS) summarizes the relationship in American culture of wildlife values and wildlife damage in this way (USDA 1994):

> *"Wildlife has either positive or negative values, depending on varying human perspectives and circumstances . . . Wildlife generally is regarded as providing economic, recreational and aesthetic benefits . . . , and the mere knowledge that wildlife exists is a positive benefit to many people. However, . . . the activities of some wildlife may result in economic losses to agriculture and damage to property . . . Sensitivity to varying perspectives and value 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."*

Wildlife damage management is the alleviation of damage or other problems caused by or related to the presence of wildlife in specific areas or situations. APHIS/Wildlife Services (WS), formerly known as Animal Damage Control, is the Federal program charged by law (Animal Damage Control Act of 1931, as amended (46 Stat. 1486; 7 U.S.C. 426-426c), Rural Development, Agriculture, and Related Agencies Appropriation Act of 1988) and authorized to manage a program to reduce human/wildlife conflicts. Given the Congressional directive, efficacy of the program will be evaluated as an issue rather than a need for the program. To fulfill the Congressional direction, the purpose of wildlife damage management is to prevent or minimize damage to the protected resources. Therefore, wildlife damage management is not necessarily based on punishing offending animals but as one means of reducing future damage. Individual situations are evaluated through use of the WS Decision Model (Slate et al. 1992) described in USDA (1994: 2-23 to 2-36). The imminent threat of damage or loss of resources is often sufficient for individual actions to be initiated. The need for action is derived from the specific threats to the resources and the methods available for responding to those threats.

Normally, according to the USDA/APHIS procedures implementing the National Environmental Policy Act (NEPA), individual wildlife damage management actions can be categorically excluded (7CFR § 372.5(c), 60 Fed Reg. 6,000-6,003). This environmental assessment (EA) has been prepared to evaluate and determine if any potentially significant impacts to the human environment are present from the proposed program in the eastern Wyoming analysis area. Prevention or reduction of wildlife damage, which often includes removal of the animals responsible for the damage, is an essential and responsible part of wildlife management and is recognized as an integral component of wildlife management (The Wildlife Society 1992). This analysis relies primarily on existing data contained in published documents and the ADC programmatic EIS (USDA 1994). Any predator damage management conducted by WS in the analysis area would be undertaken in compliance with relevant laws, regulations, policies, orders and procedures.

WS Program

WS's mission is to provide leadership in wildlife damage management for the protection of America's agricultural, industrial and natural resources, and safeguard public health and safety. This is accomplished through:

- Close cooperation with other Federal and State agencies;
- Training of wildlife damage management professionals;
- Development and improvement of strategies to reduce losses and threats to the public from wildlife;
- Collection, evaluation and distribution of information on wildlife damage management;
- Cooperative wildlife damage management programs;

- Informing and educating the public on how to reduce wildlife damage;
- Providing data and a source for limited-use management materials and equipment, including pesticides. (USDA 1989)

WS is cooperatively funded from Federal, State, county, municipal and private funds, and service oriented to reduce human/wildlife conflicts. The WS program strives to develop and utilize wildlife damage management strategies that are environmentally, socially, and biologically sound. Before any wildlife damage management is conducted, *Agreements for Control* must be signed between WS and the land owner/administrator for private lands and *WS Work Plans* must be in place for public lands. WS cooperates with land and wildlife management agencies, as requested, to effectively and efficiently resolve wildlife damage problems.

1.1 Purpose

This EA evaluates ways by which the Wyoming WS program's responsibility could be carried out within the analysis area to reduce predator damage. The EA analyzes planned and future predator damage management related to the protection of livestock, property, wildlife, and public health and safety on private and public lands in the analysis area. The area encompassed by the EA is about 12.4 million acres. WS has agreements to conduct damage management on about 5.6 million acres (45%) of the analysis area. However, WS does not typically conduct damage management on the entire area under agreement during any given year. For example, in FY 1996 WS worked on about 3.6 million acres within the analysis area, or about 29% of the analysis area (MIS 1996). The analysis area includes Federal lands under the jurisdiction of the U.S. Forest Service (Forest Service), Bureau of Land Management (BLM), National Park Service (NPS) and U.S. Fish and Wildlife Service (USFWS), and State, county, municipal and private lands.

Within the analysis area, cattle and sheep are permitted to graze on Federal lands under the jurisdiction of the Forest Service and BLM. Forest Service grazing permits generally allow grazing from mid-June to mid-October. Some BLM grazing permits allow grazing during any month of the year. Some livestock migrate from Forest Service or BLM grazing allotments to private or State lands on a seasonal basis while others spend the entire year on private lands.

This EA constitutes the required NEPA document for all WS predator damage management in the analysis area. WS conducts predator damage management on two BLM Districts (Casper and Rawlins; these activities are evaluated in existing BLM EAs (BLM 1994a, 1994b). Of the three National Forests that administer National Forest System lands within the analysis area, the Wyoming WS Program conducts varying degrees of predator damage management on the Bighorn and Medicine Bow National Forests (Forest Service 1993). Occasional predator management projects are conducted on Thunder Basin National Grasslands, which is administered by the Medicine Bow National Forest. This EA would replace existing Forest Service and BLM predator damage management EAs within the analysis area after a Decision is reached. No predator damage management has been requested on NPS or USFWS lands to protect livestock, property, wildlife, or to safeguard public health and safety, however this EA would satisfy the necessary NEPA requirement should a need arise and request be received.

Currently, there are 829 private and non-private Agreements for Control signed by landowners/administrators in counties that participate in the current cooperative WS program. Campbell County historically has operated their own predator control program with the aid of a cooperative agreement with WS to provide aerial hunting services on a case-by-case basis. Beginning in 1997 WS entered into an agreement with Campbell County to provide a fully operational program. The analysis area also encompasses five non-cooperating counties (Converse, Natrona, Platte, Laramie, Johnson) where wildlife damage problems are handled through county-administered and funded programs and/or private self-help programs without Federal funding or WS program involvement. WS does, however, have cooperative funding agreements to provide aerial hunting services upon request to Johnson County residents and to several private individuals in Natrona County.

1.2 NEED FOR ACTION

The need for action is based on the necessity for a program to protect livestock, property, wildlife, and public health and safety against predator damage. WS has been authorized and directed by Congress to provide this service

(Animal Damage Control Act of 1931, as amended (46 Stat. 1486; 7 U.S.C. 426-426c), Rural Development, Agriculture, and Related Agencies Appropriation Act of 1988). In a recent District Court decision (U.S. District Court of Utah 1993), the court ruled that, " . . . *the agency need not show that a certain level of damage is occurring before it implements an ADC program."* The court further ruled that, "*Hence, to establish need for an ADC, the forest supervisor need only show that damage from predators is threatened*." WS accepts these standards as appropriate for establishing need in the analysis area.

WS recognizes that, with the technology presently available, predator damage management is usually effective for only the current grazing season. To cause a long-term solution to livestock predation, one of two things would have to occur: (1) livestock would have to be removed from areas occupied by predators, or (2) predators would have to be removed from areas occupied by livestock. Neither of these alternatives is practical nor acceptable. Therefore, WS directs predator damage management projects toward minimizing predation during the current grazing season; realizing that natural immigration of predators from surrounding areas and annual reproduction may result in need for recurring actions the following year.

1.2.1 Summary of Proposed Action

The proposed action is to implement a program in the analysis area for the protection of livestock, property, wildlife and safeguard public health and safety against predator damage. Currently, predator damage management occurs on Federal lands administered by the BLM and Forest Service, State lands administered by Wyoming State Lands and Investments (WSLI), and on county, municipal and private lands. A fully Integrated Wildlife Damage Management (IWDM) approach would be implemented which allows for the use of all legal techniques and methods, used singly or in combination, to meet demonstrated needs. Livestock producers and others would be provided information and training on the use of effective animal husbandry and non-lethal techniques to reduce predation when requested. Lethal methods used by WS include: calling and shooting, aerial hunting, neck snares, M-44s, Livestock Protection Collar (LPC), denning, trained dogs, DRC-1339, euthanizing chemicals and the gas cartridges. Non-lethal methods used by WS include: cage traps, leghold traps, foot snares, visual and auditory scare devices, and pyrotechnics. When requested and appropriate, predator damage management would be conducted on Forest Service and BLM lands, other Federal lands, and county lands where work plans or other comparable documents are in place, and on State and private lands where there are signed *Agreements for Control*. No predator damage management would be conducted in areas receiving high levels of public use, or those with legal or policy restrictions, unless requested and coordinated with the responsible management agency. A WS Work Plan would be cooperatively developed with each National Forest and BLM District within the analysis area, as appropriate. These work plans delineate where, when and how predator damage management would be conducted, and reviewed annually by WS and the appropriate cooperating agency. The cooperating agencies would be responsible for insuring that resources under their jurisdiction are protected while also insuring that wildlife damage is kept to a minimum. See Chapter 3 for a more detailed description of the current program and the proposed action.

1.2.2 Need for Predator Damage Management for Protection of Livestock and Poultry

Contribution of Livestock to the Economy

Agriculture ranks among the top three industries in Wyoming with an estimated economic impact approaching or exceeding $1 billion annually (Wyoming Agricultural Statistics (WAS) 1997). According to the Wyoming Division of Economic Analysis, the Agricultural sector - farm and AG services - provides over 17,000 jobs. Cash income from Wyoming agriculture in 1996 totaled about $662 million, a reduction of 9% from 1995 (WAS 1997). In 1995, marketing of livestock and livestock products account for about 75% of Wyoming's agricultural cash receipt (WAS 1996). About 56 percent of Wyoming land area, or 34.6 million acres, are controlled and operated by 9,100 farms and ranches . The January 1, 1997 inventories of cattle and calves totaled 1.49 million head, with a value of $894 million (WAS 1997). An estimated 770,000 calves were born on Wyoming farms and ranches during 1996, a 4% increase over 1995 and the highest number since 1974 (WAS 1997).

Wyoming sheep and lamb inventory on January 1, 1997 was 720,000 head with a value of about $72 million (WAS 1997). Stock sheep decreased 2% from 1996 while market sheep increased 52,000 head. Sheep and lamb inventory was up 6% from 1995, following annual declines in numbers for several years (WAS 1996). Declines have been the result of several factors, including low market prices for lambs and wool, increased cost of production, and predation (R. Phillips, WS, pers. obs., U. S. District Court of Utah 1993). Wyoming ranks second nationally in stock sheep and lamb production, third for sheep and lambs on feed for slaughter, and second nationally in wool production. An estimated 5.81 million pounds of wool were produced in Wyoming during 1996 for a total value of $5 million, down 9% from 1995 and a record low. The price per pound decreased by 35% over 1995 prices (WAS 1997).

Livestock production in the analysis area contributes significantly to the economy of Wyoming. About 21% of all sheep and lambs and 35% of all cattle and calves produced in Wyoming are raised in the analysis area. Livestock inventories from the counties in the analysis area are about 283,000 head of cows that calved and 115,000 breeding sheep (Table 1-1). These livestock are valued at more than $180.7 million (WAS, 1997).

Scope of Livestock Losses

Livestock producers lost an estimated 116,000 sheep and lambs to all causes during 1996, 3% less than in 1995. Predators accounted for 59% of the total sheep death losses. Total predator losses were 69,000 head, up 5% from the previous year but down 28% from 1994. Coyotes (*Canis latrans*) continued to cause the most predator losses (71%), followed by eagles (*Aquila chrysaetos* and *Haliaeetus leucocephalus*) with 7% and red fox (*Vulpes vulpes*) with 6% of losses. The economic loss to sheep and lamb producers caused by predators in 1996 was an estimated $4.07 million (WAS 1996).

In 1996, the WAS (1997) reported that predators killed 9,000 adult sheep valued at about $828,000 and 60,000 lambs valued at $3,246,000. The National Agricultural Statistics Service (NASS 1997) reported that in Wyoming predators killed 200 cattle (1.3% of the total loss) and 1,600 calves (5.3% of the total loss), valued at $694,000.

Table 1-1. Livestock Inventory by County in the Eastern Wyoming Analysis Area in 1996-1997 (WAS 1997)

County	Cows That Calved		Breeding Sheep	
	1997	1996	1997	1996
Albany	31,000	28,000	4,000	5,000
Campbell	54,000	46,000	41,000	43,000
Crook	42,000	39,000	34,000	39,000
Goshen	37,000	35,000	2,000	2,000
Niobrara	27,000	26,000	16,000	16,000
Sheridan	64,000	58,000	11,000	11,000
Weston	28,000	27,000	7,000	7,000

Cattle and calves are most vulnerable to predation (killing, harassment, or injury) at calving time and less vulnerable as calves get older and larger (Shaw 1977, 1981, Horstman and Gunson 1982). Black bear (*Ursus americanus*), grizzly bear (*U. horribilis*) and mountain lion (*Puma concolor*) predation on livestock can be severe (NASS 1991, 1996, MIS 1996). Because calving generally occurs at lower elevations, vulnerability of calves to mountain lion and bear predation is reduced. Calves, however, remain vulnerable to these predators if they are grazed in higher elevations in more suitable habitats for mountain lions and bears.

Sheep and lambs are vulnerable to predation throughout the year, particularly from coyotes and to mountain lions and bears whenever they spend time in habitats of these species (Henne 1977, Nass 1977, 1980, Tigner and Larson 1977, O'Gara et al. 1983, Shaw 1987). Domestic dogs are also responsible for predation on sheep and lambs throughout the year (WAS 1996). Newborn and young lambs are sometimes vulnerable to red fox predation, primarily at the lower elevations. Bears and mountain lions are occasionally responsible for large losses of sheep and lambs (Mysterud 1977, Shaw 1987), sometimes called *"surplus killing"* when only selected tissues or parts are consumed or the carcasses are not fed on. Bears or mountain lions may also frighten an entire flock of sheep as they attack, causing a mass stampede. This sometimes results in many animals suffocating as they *"pile up"* 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, causing substantial economic hardships to livestock owners.

Many studies have shown that coyotes inflict high predation rates on livestock. Coyotes accounted for 93% of all predator-killed lambs and ewes on nine sheep bands in shed lambing operations in southern Idaho and they did not feed on 25% of the kills (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). The question of whether or not all coyotes kill sheep may be of little relevance, since a depredating coyote may readily gain access and kill sheep in another coyote's territory (Shivik et al. 1996). Therefore, management that selectively leaves territorial non-sheep killing coyotes in a population would not necessarily safeguard against sheep kills by other coyotes. The beneficial secondary effects of leaving territorial non-sheep killing coyotes within a population may be negligible (Shivik et al. 1996).

The Wyoming Game and Fish Department (WGFD) reported that bear and mountain lion damage may be increasing within the analysis area. However, the WGFD believes depredation is directed more toward sheep than cattle. From January 1990 until March 1997, six damage claims for mountain lion depredation to cattle and 15 claims for black bear depredation to cattle have been filed with WGFD statewide (Faccianni, 1997). Dogs are responsible for considerable predation on livestock and wildlife. The WAS (1996) reported that in 1994, 400 adult sheep and 400 lambs were killed by dogs, and in 1995 there were 500 adult sheep and 600 lambs killed by dogs in Wyoming.

Connolly (1992a) determined that only a fraction of the total predation attributable to coyotes is reported to or verified by WS. Verified losses are only those losses that WS personnel scrutinized and determined killed by predators. Connolly also suggested that the fraction of actual losses typically verified by WS could be expected to be between 5-20% (Connolly 1992b). WS personnel do not attempt to find every head of livestock reported to be killed, but to verify sufficient losses to determine that a problem exists that requires management action and the species responsible for predation.

Although it is impossible to accurately determine the amount of livestock saved from predation by WS, it can be estimated. Predation on livestock can have a significant economic impact on livestock producers. Without effective predator damage management to protect livestock, predation would be higher (Nass 1977, 1980, Howard and Shaw 1978, Howard and Booth 1981, O'Gara et al. 1983). Increased (livestock) predation loss was the predominant reason ranchers were leaving the sheep business and threatened the economic viability of livestock grazing permittees (U.S. District Court of Utah 1993). Scientific studies reveal that in areas without some level of predator damage management, losses of adult sheep and lambs to predators can be as high as 8.4% and 29.3%, respectively (Henne 1977, Munoz 1977, O'Gara et al. 1983). Conversely, other studies indicate that sheep and lamb losses are much lower where predator damage management is applied (Nass 1977, Tigner and Larson 1977, Howard and Shaw 1978, Howard and Booth 1981).

Table 1-2 shows the WS verified livestock losses for 1996 from cooperating producers by county and value. Of these, coyote predation accounted for 100% of the verified calf loss, 100% of adult sheep loss, and 94.4% of the lambs verified killed during FY 1996 (MIS 96). Further analyses of verified loss included: red fox, 5.6% of lambs (MIS 1995). In addition, the percentage breakdown for reported but unverified loss (all classes of livestock) is: coyotes 98.9%, mountain lion 0.3%, red fox 0.6%, and domestic dog 0.3%. These losses occurred in spite of current damage management efforts by producers, who often entail substantial indirect costs (Jahnke et al. 1987), and the Wyoming WS program. Wyoming WS (unpubl. data) indicate that 96% of 527 cooperating producers in the analysis area currently practice at least one non-lethal measure and 63% use three or more non-lethal methods. Fully 27% of these producers use 5 or more non-lethal methods to help reduce predation, with some producers utilizing as many as 10 separate strategies (Wyoming WS unpubl. data) Non-lethal options for cattle producers are more limited, yet many producers practice improved husbandry at calving time and other techniques, in part, to reduce predation. Of the 527 cooperating producers, 67% are cattle producers, 6% raise only sheep, and 27% raise both sheep and cattle. Of those who raise sheep, 33% are utilizing guard dogs as one of their non-lethal strategies (Wyoming WS unpubl. data).

1.2.3. Need for Predator Damage Management to Protect Wildlife.

Table 1-2. FY 1996 Verified Livestock Killed by Predators in the Eastern Analysis Area (MIS 1996)

County	Lamb	Sheep	Cattle	Calves	Poultry & Other	Value ($)
Albany	34	24	0	1	0	$5,030
Campbell	2	1	0	0	0	$640
Crook	105	29	0	1	0	$8,706
Goshen	1	4	3	15	8	$4,304
Niobrara	59	7	0	6	0	$6,400
Sheridan	44	12	0	4	0	$4,820
Weston	47	0	0	8	0	$3,540
Totals	**292**	**77**	**3**	**35**	**8**	**$33,250**

Revenue derived from recreation, especially recreation related to wildlife and the outdoors, is increasingly important to the economy of Wyoming. Southwick (1994) estimated the total economic impact from deer hunting in the United States in 1991 to be $16.6 billion. In Wyoming, local economies also benefit from these wildlife-related recreational activities. Hunting generated more than $92 million in retail sales, created more than 2,900 jobs and produced more than $4.5 million in Federal income tax in Wyoming (Southwick 1994). As a result, the maintenance of wildlife populations is important to the WGFD which has the responsibility for managing resident wildlife for the benefit of the State.

It should be remembered that predation is a natural mortality factor in any prey population. Factors such as predator densities, alternate prey densities, weather conditions, vegetative cover (influencing ability of prey animals to hide or escape), and prey vulnerability can influence survival and recruitment of young into a population. Predation on game species is well documented and can adversely impact survival and recruitment of individuals into a population, especially when environmental factors (i.e., weather influences, forage conditions, prey populations, vulnerability, etc.) are poor and do not favor the prey species (for additional discussion of predator/prey relationships see 2.3.1). Under certain conditions, predators, primarily coyotes, have been documented as having a significant adverse impact on wildlife populations and this predation is not necessarily limited to sick or inferior animals (Pimlott 1970, Bartush 1978, USDI 1978, Hamlin et al. 1984, Neff et al. 1985). Connolly (1978) reviewed 68 studies of predation on wild ungulate populations and concluded that, in 31 cases, predation was a limiting factor. These studies demonstrated that coyote predation had a significant influence on white-tailed deer (*Odocoileus virginianus*), black-tailed deer (*O. hemionus columbianus*), pronghorn antelope (*Antilocapra americana*), and bighorn sheep (*Ovis canadensis*). Other studies indicate that predation could adversely impact game bird and T&E species populations (Johnson et. al. 1988, Gazda and Connelly 1993, Thomas 1989, Speake 1985, Kurzejeski et al. 1987, Wakeling 1991, USDI 1995, Drewien et. al. 1985, Massey and Atwood 1981, Gore and Kinnison 1991, MacIvor et al. 1990).

Predator damage management undertaken to protect livestock could be coordinated to augment wildlife management objectives/goals of the WGFD or the USFWS. Conversely, a lack of predator damage management to protect livestock could conceivably result in adverse impacts to some wildlife species.

Deer

Mackie et al. (1976) documented high winter loss of mule deer (*Odocoileus hemionus*) to coyote predation in north-central Montana and stated that coyotes were the cause of most overwinter deer mortalities. Teer et al. (1991) documented that coyote diets contained nearly 90% deer during May and June. They concluded from

work done at the Welder Wildlife Refuge in Texas that coyotes take a large portion of the fawns each year during their first few weeks of life. Remains of 4 to 8 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). Another Texas study (Beasom 1974a) found that predators were responsible for 74% and 61% of the fawn mortality for two consecutive years. Hamlin et al. (1984) observed that a minimum of 90% summer mortality of fawns was a result of coyote predation. Garner (1976), Garner et al. (1976) and Bartush (1978) found annual losses of deer fawns in Oklahoma to be about 88% with coyotes responsible for 88% to 97% of the mortality. Trainer et al. (1981) reported that 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 on Steens Mountain in Oregon. Their study concluded that predation, primarily by coyotes, was the major cause for low fawn survival. Other authors observed that coyotes were responsible for most of fawn mortality during the first few weeks of life (Knowlton 1964, White 1967).

Mule deer fawn survival was significantly increased and more consistent inside a predator-free enclosure in Arizona (LeCount 1977, Smith and LeCount 1976). 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) increased deer production on 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. 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 (hunting), ultimately returned to original densities due primarily to malnutrition and parasitism.

Pronghorn Antelope

Jones (1949) recognized that coyote predation was the main limiting factor of pronghorn antelope in Texas nearly five decades ago. 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). 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, Hailey 1979, Tucker and Garner 1980).

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. Coyote damage management on Anderson Mesa increased the herd from 115 animals to 350 in three years, and peaking at 481 animals in 1971. 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 removal 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 1008 antelope, exceeding 1000 animals for the first time since 1960. Fawn production increased from a low of 7 fawns per 100 does in 1979 to 69 and 67 fawns per 100 does in 1982 and 1983, respectively (Neff et al. 1985). 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 predator damage management have been reported by Riter (1941), Udy (1953), and Bodenchuk (1995). Coyote reduction was necessary and cost effective in pronghorn antelope management, as shown by Smith et al. (1986).

Bird Species of Special Concern

In a study of waterfowl nesting success in Canada, researchers found that eggs in most nests were destroyed by predators. These predators included red fox, coyote, striped skunk (*Mephitis mephitis*), raccoon (*Procyon lotor*), Franklin's ground squirrel (*Citellus franklini*), badger (*Taxidea taxus*), black-billed magpie (*Pica pica*) and American crow (*Corvus brachyrhynchos*) (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 that skunks and raccoons are major waterfowl nest predators that can

contribute to poor nesting success (Keith 1961, Urban 1970, Bandy 1965). On the Sterling Wildlife Management Area in southern Idaho, striped skunks, red fox and black-billed magpies were documented as common predators of nesting ducks, (Gazda and Connelly 1993). Thomas (1989) and Speake et al. (1985) reported that predators were responsible for more than 40% of nest failures of wild turkeys (*Meleagris gallopavo*) in New Hampshire and Alabama, respectively. Everret et al. (1980) reported that predators destroyed 7 of 8 nests on his study area in northern Alabama. Lewis (1973) and Speake et al. (1985) reported that predation was the leading cause of mortality in turkey poults, and Kurzejeski et al. (1987) reported in a radiotelemetry study that predation was the leading cause of mortality in hens. Wakeling (1991) reported that the leading natural cause of mortality among older turkeys was coyote predation, with the highest mortality rate for adult females occurring in winter. Other researchers report that hen predation is also high in spring when hens are nesting and caring for poults (Speake et al. 1985, Kurzejeski et al. 1987, Wakeling 1991). Dumke and Pils (1973) reported that ringed-neck pheasant (*Phasianus colchicus*) hens were especially prone to predation during the nest incubation period. In Minnesota, pheasant hatching success and brood production was more than doubled with an intensive reduction of predators (Chessness et al. 1968).

In documenting an extensive study of the effects of red fox predation on waterfowl in North Dakota, Sargeant et al. (1984) concluded that reducing high levels of predation was necessary to increase waterfowl production. Williams et al. (1980) reported that a 72% hatching success of wild turkey eggs following a predator poisoning campaign, but only 59% when predators were not poisoned. Trautman et al. (1974) stated that during a 5-year study in South Dakota, there was a 19% increase in ring-necked pheasant populations on areas with only fox predator damage management. During a second 5-year study in South Dakota, ring-necked pheasant populations increased 132% on areas with red fox, raccoon, badger, and skunk damage management (Trautman et al. 1974). Balser et al. (1968) determined that predator damage management resulted in 60% greater production in waterfowl in areas with damage management areas as compared with areas without damage management. He also recommended that when conducting predator damage management, to target the entire predator complex or compensatory predation may occur by a species not under control, a phenomena also observed by Greenwood (1986).

Threatened and Endangered (T&E) Species and Special of Special Concern

Predation can have a major impact on T&E species. Predation has been documented in black-footed ferret (*Mustela nigripes*) reintroductions in Wyoming, South Dakota and Montana (E. Stukel, SD Game, Fish and Parks pers. comm. 1995; USDI 1995a). Drewien et. al. (1985) found that coyote and red fox predation on endangered whooping crane (*Grus americana*) eggs and chicks was common during a whooping crane cross-fostering experiment at Grays Lake National Wildlife Refuge, Idaho. The swift fox (*Vulpes velox*) is the smallest member of the prairie adapted canids and susceptible to coyotes and other larger predators (Egoscue 1979, Herrero 1984, Carbyn et al. 1994). Hines and Case (1991) observed coyotes in the habitat of swift fox. The petition to list the swift fox recognizes and states several times that, *"The negative impact of coyotes on swift fox is well accepted."* Kilgore (1969) stated that coyotes are logical predators of swift fox and that substantial populations of swift fox were again available for study because coyotes were absent from his study area because of control before the study. Egoscue (1979), and Scott-Brown and Herrero (1985) stated that coyotes are known to kill swift fox. Herrero et al. (1986) stated that higher coyote densities may in fact threaten the establishment and long-term survival of reintroduced swift fox. Carbyn et al. (1994) reported that 58% of swift fox mortality was caused by predation, with the coyote clearly *"the greatest cause of* (predator) *mortality."* Covell (1992) reported that predation and nondramatic deaths accounted for 87% and 13% of all determined deaths, respectively. Coyotes were responsible for 85% of all predation. Clearly, then predator damage management may in fact be an important tool for enhancing swift fox populations

Predator damage management measures were implemented in response to this finding, and the authors concluded that predator damage management was effective in reducing mortality of whooping cranes and other avian species nesting at Grays Lake. Massey (1971) and Massey and Atwood (1981) found that the presence of predators alone can prevent least terns (*Sterna antillarum*) from nesting and cause them to abandon previously occupied sites. Mammalian predators were found to have significantly impacted the loss of least tern eggs on sandbars and sandpits (Kirsch 1996). Skunks (Massey and Atwood 1979), red fox (Minsky 1980), coyotes (Grover and Knopf 1982), and raccoons (Gore and Kinnison 1991) are common

predators of least terns. During a two-year study, coyote predation accounted for 25% to 38.5% of the nesting interior least tern (Grover 1979). In Massachusetts from 1985-1987, predators destroyed 52-81% of all active piping plover (*Charadrius melodus*) nests (MacIvor et al. 1990). Red foxes accounted for 71-100% of the nests destroyed by predators at the site (MacIvor et al. 1990).

Summary

Based on research and experience, some State and Federal wildlife management agencies have found that predator damage management can increase specific wildlife populations where predation is affecting the ability of these populations to maintain or increase their densities (recruitment). It is also reasonable to assume that wildlife populations in areas where predator damage management is being conducted for protection of livestock could be receiving a benefit from those actions. It should, however, be emphasized that management of game animals and birds in Wyoming is the responsibility of WGFD. The WGFD has held that while in some situations predators may need to be controlled to assist a wildlife population, these cases are the exception and that, in most cases, the wildlife population is probably limited in numbers due to other factors, such as habitat loss. The WGFD believes that predator control for protection of free-ranging wildlife populations is not economical (Facciani, 1997).

Predator damage management could be requested on a case-by-case basis when WGFD or the USFWS determines predation is detrimental to management objectives, and WS would only respond after WGFD or the USFWS has made such a determination.

1.2.4 Need for Predator Damage Management for Nuisance or Threatening Wildlife to Public Safety.

The WGFD is responsible for responding to nuisance or threatening wildlife to public safety. Within the analysis area, human interactions with nuisance or threatening (diseased) wildlife could occur wherever habitat or food sources overlap with human activities. When WS responds to livestock damage requests involving bear or mountain lion damage, management is initiated only after coordination with the WGFD.

Within the analysis area, rabies has been identified as a threat to human and animal health and safety. During 1996, Wyoming WS conducted a rabies threat reduction program in Campbell County at the request of the Wyoming Department of Health and Campbell County officials. Rabies is a viral disease that is generally transmitted by an infected animal biting or scratching an uninfected individual and transmitting contaminated saliva to an open wound. Therefore, individuals bitten or scratched by a known rabid animal or an animal likely to have been infected are considered in need of treatment by post-exposure vaccination. The rabies virus infects nerve tissue and results in irreversible, fatal damage to the brain. All mammals are susceptible to infection by rabies virus; in wild species the disease is much more common in omnivores or carnivores. High risk species include: raccoons, foxes, skunks, and bats. Livestock, dogs, cats, and humans may be exposed by these species of wildlife. Other diseases of concern are: canine distemper, parvovirus, tularemia, leptospirosis, trichinosis, infectious canine hepatitis, sarcoptic mange, plague.

In 1996, 21 skunks, 1 dog and 1 horse were tested positive for rabies in Campbell county. Following an intensive trapping program, no further positive rabies has been reported in the local trapping area. By targeting vector animals, specifically skunks, in areas known to have produced rabid animals the spread of rabies can be reduced and a buffer established between potential carriers and areas of human habitation.

Mountain lion and bear populations are estimated to be increasing (WGFD, pers. comm. 1995) based on increasing observations, road kills and damage complaints. Although rare, mountain lion attacks on humans in the western United States and Canada have increased markedly in the last two decades, primarily due to increased mountain lion populations and human use of mountain lion habitats (Beier 1992). The recent fatal attacks in Montana, California, Colorado and British Columbia also emphasize the need for awareness.

When bears and mountain lions damage property or threaten public health and safety, immediate action is taken. Normally, WGFD responds to nuisance bear and mountain lion complaints and public health and safety threats. WS responds to livestock-related bear and mountain lion problems when requested by

producers, and could respond to bear and mountain lion threats to public health and safety situations when requested by the WGFD. Wyoming statutes state that livestock depredating black bear may be destroyed by the landowner, the landowner's employee or lessee (Wyoming State Statutes (WSS) 23-3-115). Other WGFD management alternatives for black bears would include lengthening the hunting season or increasing the number of hunting permits in areas experiencing problems with black bears if the circumstances indicate such action.

1.3 RELATIONSHIP OF THIS EA TO OTHER ENVIRONMENTAL DOCUMENTS AND MANAGEMENT PLANS

1.3.1 WS Programmatic EIS. WS has issued a Final EIS on the national APHIS/WS program (USDA 1994). Pertinent and current information available in the EIS has been incorporated by reference into this EA. The Record of Decision (ROD) for the EIS was published on March 7, 1995. This EA will be evaluated for consistency with the ROD. If inconsistencies are found, the EA would be supplemented pursuant to NEPA.

1.3.2 National Forest Land and Resource Management Plans (LRMPs). The National Forest Management Act requires that each National Forest (NF) prepare a Land and Resource Management Plan (LRMP) for guiding long-range management and direction. The National Forests administering lands in the analysis area accomplished this requirement in the early to mid 1980's. These first generation LRMP's contained directions, goals, standards and guidelines that were appropriate for that time. Revisions of LRMPs occur at approximately ten to fifteen-year intervals. In July 1997, the Black Hills NF completed a revision of the LRMP. The Medicine Bow NF has begun early stages of revision. The Thunder Basin National Grassland (administered by Medicine Bow NF) has joined other National Grasslands for revision efforts. The Bighorn NF is in the early stages of revision. Since the 1993 national Memorandum of Understanding (MOU) between the Forest Service and WS, the Forest Service has been working with WS to transition into the procedures outlined in the MOU. The MOU formulates an agreement that the Forest Service would cooperate with WS in the development and annual review of Forest-wide Animal Damage Management (ADM) (work) plans. This cooperation is one means of insuring the compatibility of WS proposed damage management actions with National Forest System LRMPs.

The National Forest LRMPs pertinent to the analysis area have varying levels of reference to ADM. The 1993 MOU is the primary operating instrument to bring continuity to these LRMPs and their relationship to WS ADM .

The **Bighorn National Forest LRMP** addresses wildlife damage management with a view to target offending animals and presenting the least risk to non-target species and human Forest users. Cooperation with other agencies to prevent damage is a General Direction. Forest Service, Region 2 Forests display standardized General Directions for ADM.

The **Medicine Bow National Forest LRMP** addresses wildlife damage management in the context of cooperation with appropriate agencies. It gives a General Direction, *"To prevent or reduce damage to other resources and direct control toward preventing damage or removing only the offending animal."*

The **Thunder Basin National Grasslands** are managed by the Medicine Bow National Forest. The 1985 LRMP for the Medicine Bow NF also addressed animal damage management for the National Forest System lands that are in the proclaimed national grassland.

The **Black Hills National Forest LRMP** (revised July 2, 1997, second generation) references a related National Goal, Animal Damage Management - 2650.2, *"The objective of animal damage management activities is to protect National Forest System resources, to protect activities taking place on National Forest System lands, and to reduce threats to human health and safety."* The revised LRMP reflects a forest wide standard for Animal Damage Control, 3214. *"For Animal Damage Management activities conducted by other governmental entities, the Forest Service will cooperate by providing mitigation*

measures to protect National Forest resources. Mitigation measures emphasize protection of public safety; threatened, endangered, and sensitive species; water quality; and other resource values."

1.3.3 National Forest EAs for Predator Damage Management. Predator damage management would continue under Forest Service documents until superseded by a new decision. An EA prepared by the Forest Service to address predator damage management by WS is currently in place on the Bighorn NF (Forest Service 1993).

1.3.4 BLM Resource Management Plans/Environmental Impact Statements (RMP/EISs).

The **Casper BLM District RMP** states that planning decisions affecting WS activities in the Casper District are contained in the Platte river Resource Area RMP, the Buffalo Resource Area RMP, and the Newcastle Resource Area Management Framework Plan. WS activities are in conformance with, and do not deviate from, the intent of each of these planning documents. Damage management activities would be carried out in accordance with the Interagency MOU Concerning Animal Damage Control and National Environmental Policy Act Compliance (5/16/95) between WS and the BLM.

The **Rawlins BLM District.** Lands within the analysis area managed by the Rawlins BLM District are covered in the Great Divide Resource Area Resource Management Plan (RMP) which states that predator damage management will be coordinated with APHIS-WS and conducted according to the *"Cooperative Wildlife Services Plan for Public Land in the Rawlins District"* (Work Plan). The Rawlins BLM District has authorized predator damage management at the request of permittees or the WGFD, and has an WS Work Plan (BLM 1994c).

1.3.5 BLM EAs for Predator Damage Management. EAs prepared by the BLM to address predator damage management conducted by WS are currently in place on the Casper (BLM 1994a) and Rawlins (BLM 1994b) Districts. In 1995, WS adopted the Rawlins District EA and wrote a new Decision to include WS predator damage management on intermingled and contiguous private and State lands.

1.3.6 Final EIS on The Reintroduction of Gray Wolves to Yellowstone National Park and Central Idaho. The entire analysis area is within the non-essential experimental gray wolf (*Canis lupus*) population area identified in the Reintroduction of Gray Wolves to Yellowstone National Park and Central Idaho EIS. This document and 50 CFR § 17.84 provide guidance on when, where, and how wolf damage management would be conducted. WS is authorized to assist the USFWS in reducing wolf predation on livestock on private and public land in the Northern Rocky Mountains. The Northern Rocky Mountain Wolf Recovery Plan (USDI 1987) indicates that, if necessary, lethal damage management could be used to stop depredations. Any decision made from this EA process would be consistent with that guidance.

1.3.7 Interagency Grizzly Bear Committee Guidelines. These guidelines address when and how management of nuisance and depredating grizzly bears would occur and defines agency roles and responsibilities. Grizzly bears are not known to occur within the eastern analysis area at this time; however, if grizzly bears should disperse into the area, any decision made from this EA process would be consistent with guidance in the contingency plan. Damage management of grizzly bears would be conducted in accordance with State and Federal laws, regulations, and policy. Handling and control of nuisance grizzly bears would be governed by the grizzly bear special rule (50 CFR § 17.40) and guidance provided by the Interagency Grizzly Bear Guidelines (IGBC 1986). Control actions are designed to capture and remove the specific target bear(s).

1.3.8 WGFD Wildlife Management Plans. WGFD has prepared strategic plans for big game and game birds, and management plans for black bear (WGFD 1994) and mountain lion (WGFD 1996a). These plans outline the management goals, objectives, strategies and methodologies for these species, and as other plans are developed the EA would be reviewed to ensure consistency. Criteria from existing plans are incorporated by reference into this EA and used for the analysis.

1.4 DECISION TO BE MADE

Based on agency relationships, MOUs and legislative direction, WS is the lead agency for this EA and therefore responsible for the scope, content and decisions made. As cooperating agencies, the Forest Service, BLM, WGFD, Wyoming Department of Agriculture (WDA) and WSLI have provided input throughout preparation of the EA to ensure an interdisciplinary approach in compliance with NEPA, and that the EA and agency authorities, policies, plans and regulations would be in compliance.

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

- Should predator damage management be continued as currently implemented in the analysis area (the "no action" alternative)?

- If not, how should WS fulfill their legislative directive and responsibilities in the analysis area.
- Might the proposal have significant impacts needing an EIS.

1.5 SCOPE OF THIS ENVIRONMENTAL ASSESSMENT ANALYSIS

1.5.1 Actions Analyzed. This EA evaluates planned predator damage management to protect livestock, property, designated wildlife (as determined by WGFD or USFWS), and public health and safety threats from predation/disease within the analysis area. Other program activities will be addressed in other NEPA documents. Cultural and archeological concerns are considered and addressed in this document as they relate to the proposed action.

1.5.2 Wildlife Species Potentially Protected by WS Besides Mule Deer and Pronghorn Antelope. Short-term predator control projects may be necessary in the following situations:

In waterfowl production areas and bighorn sheep transplant areas (WGFD 1996b).

For protection/enhancement of T&E or candidate species populations under special circumstances. For example, Wyoming WS historically aided the USFWS and WGFD in black-footed ferret reintroduction areas by collecting predators (coyotes and badgers) for disease and parasite analysis. "*Coyote control, through lethal control and exclusionary fencing, has proven valuable by dramatically increasing short-term survival rates in black-footed ferrets at the Montana reintroduction site"* (USDI 1996).

NEPA analysis of wildlife damage management for other species would be conducted by the authorized agency. This EA would be reviewed and if necessary supplemented pursuant to NEPA, or other Federal agency (ies) would conduct their own NEPA analysis.

1.5.3 Counties Not Currently Part of the Operational WS Predator Damage Management Program. Converse, Laramie, Natrona and Platte Counties administer their own predator control programs without WS involvement or funding assistance. Campbell and Johnson Counties also administer their own programs but have cooperative funding agreements with WS to provide aerial hunting services. Beginning in FY 97, Campbell County has signed a cooperative funding agreement for fully operational WS program. An important part of WS's involvement in Campbell County will be dealing with threats to public health and safety (rabies). WS policy is to provide service to entities experiencing wildlife damage when requested and appropriate within the constraints of available funding and workforce. Therefore, WS may have signed *Agreements for Control* with entities from any of the above counties. Predators taken by WS and livestock losses reported to or verified by WS are included in this analysis. Should any of the currently non-cooperating counties enter into Cooperative Agreements with WS, this EA would be reviewed and if necessary supplemented by WS pursuant to NEPA.

1.5.4 American Indian Lands and Tribes. There are no tribal lands within the analysis area.

1.5.5 Period for Which this EA is Valid. This EA would remain valid until WS and other appropriate agencies determine that new needs for action or new alternatives having different environmental effects must be analyzed. Then, this analysis and document would be supplemented pursuant to NEPA. Review of the EA would be conducted each year at the time of the planning process by WS and cooperating agencies to ensure that the EA is complete and appropriate.

1.5.6 Site Specificity. This EA addresses the potential impacts of predator damage management on all lands under Cooperative Agreement, Agreement for Control or WS Work Plans in the analysis area. These lands are under the jurisdiction of the Forest Service, BLM, State, county, municipal, and private ownership. It also addresses the potential impacts of predator damage management on areas where additional agreements may be signed in the foreseeable future. Because the proposed action is to reduce wildlife damage and because the program's goals and directives are to provide service when requested, within the constraints of available funding and workforce, it is conceivable that additional wildlife damage management efforts could occur. This EA emphasizes major issues as they relate to specific areas whenever possible; however, many issues apply wherever predator damage and resulting management occur, and are treated as such. The Decision Model (Slate et al. 1992) would be the site-specific procedure for individual actions conducted by WS in the analysis area. (See Chapter 3 for a description of the Decision Model and its application.)

1.5.7 Summary of Public Involvement Efforts. Issues related to the proposed action were identified during the public involvement process conducted with members of the livestock industry, environmental interest groups, the general public, American Indian tribes, BLM, Forest Service, WGFD, WDA, and WSLI resource specialists, County Commissioners, County Predatory Animal Boards and other State and Federal agencies. The public was notified about the proposed action through a letter requesting *public involvement* and invited to comment on the eastern or western Wyoming program, or both. This letter was mailed to about 2,500 individuals, organizations and agencies, and legal notices were published in five newspapers throughout Wyoming (some newspapers have statewide distribution). Among key interest groups contacted were: Predator Project, Wildlife Damage Review, The Humane Society of the U.S., Friends of the Bow/Biodiversity Project, Wyoming Wildlife Federation, Wyoming Outfitters Assoc., Friends of Animals, American Sheep Industry Association, National Audubon Society, Sierra Club, Defenders of Wildlife, PETA, the Wyoming Stock Growers, and the Wyoming Wool Growers Association.

Public involvement responses were received and documented from 125 letters and telephone calls. Most respondents addressed their comments to both the eastern and western analysis areas. The responses represented a wide range of opinions, both supporting and opposing the proposal. All responses were given full consideration, even though some were received after the official response period had ended. All comments received are maintained in the administrative file at the WS State Director's Office, POB 59, Casper, WY 82602.

1.5.8 Other Agency Involvement. To assure that the concerns of other Federal and State agencies have been addressed, the Forest Service, BLM, WGFD, WDA, and WSLI were asked to participate on the Multi-agency Team, and are cooperating agencies in the development of the EA. A team of resource specialists with expertise in range management, wildlife biology, wildlife damage management, cultural resources and environmental coordination evaluated the issues identified in the public involvement process. Issues determined to be significant and relative to the analysis are discussed in Chapter 2 and evaluated in Chapter 4. Concerns that were not significant were not analyzed in detail. The USFWS was consulted regarding possible impacts (either positive or negative) to T&E species. In addition, the *Pre-Decisional* EA was circulated to each National Forest in the analysis area, the Forest Service Regional Office, BLM State and District Offices and other Federal agencies within the area of coverage. American Indian Tribes were provided a copy of the *Pre-Decisional* EA and asked to review and comment.

1.5.9 Results of the Review of the *Pre-Decisional* Environmental Assessment. Any additions or revisions deemed necessary after reviewing public comments related to this EA would be handled either through revision of the EA or by addressing specific public comments in conjunction with the written decision document. The documentation on the public involvement effort, including the written responses, would be

available for public review. They are located in the administrative file in the WS State Director's Office, POB 59, Casper, Wyoming 82602.

1.6 AUTHORITY AND COMPLIANCE

1.6.1 Authority of Federal and State Agencies in Wildlife Damage Management in Wyoming[1]

WS Legislative Authority

The primary statutory authority for the WS program is the Wildlife Services Act of 1931, 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 the changes in societal values, WS policies and its 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. 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."*

1.6.2 Wyoming Game & Fish Department (WGFD)

The WGFD has the responsibility to manage all protected and classified wildlife in Wyoming, except Federally listed T&E species, regardless of the land class on which the animals are found (WSS 23-1-103, 302). By Wyoming statute and policy, the State provides for the conservation of lands, protection of natural resources, wildlife and public lands (WSS 11-16-103). WGFD is also authorized to cooperate with WS and the WDA for controlling predatory animals (WSS 11-6-104, 107, 108). Wyoming State law allows: 1) predatory animals to be taken at any time and in any manner (WSS 23-3-103), 2) an owner, employee of the owner, or lessee to take any black bear, mountain lion, or bobcat that is causing damage to private property (WSS 23-3-115), and 3) owners of private property damaged or killed by trophy game animals (black bear, mountain lion, or grizzly bear) are to be compensated for the loss by WGFD (WSS 23-1-901). In Wyoming, black bear and mountain lion management is the responsibility of the WGFD. However, in coordination with WGFD, WS would take depredating bear and mountain lion on a case-by-case basis.

1.6.3 Wyoming Department of Agriculture (WDA)

[1] Detailed discussions of the legal authorities and relationships of pertinent Federal wildlife and land management entities, and key legislation pertinent to wildlife damage management are found in Chapter 1 of USDA 1994.

The WDA is authorized to enter into Cooperative Agreements with WS and local entities for reducing damage caused by predatory animals or to administer such programs (WSS 11-6-104). The WDA is also responsible for the issuance of permits for aerial hunting per the Fish and Wildlife Act of 1956, as amended (WSS 11-6-105). The WDA currently has an MOU, Cooperative Agreement, and work plan with WS. These documents establish a cooperative relationship between WS and WDA, outline responsibilities, and set forth annual objectives and goals of each agency for resolving wildlife damage in Wyoming.

1.6.4 County Predatory Animal Districts and State Predatory Animal Advisory Board

Each county in Wyoming is legislatively designated as a Predatory Animal District (WSS 11-6-201) with the authority to hold property and be a party to suits and contracts. The individual districts have the responsibility to, *"Exercise general supervision over the predatory animals that prey upon and destroy livestock, other domestic animals and wild game"* within the boundaries of the county (WSS 11-6-205). Therefore, the individual County Predatory Animal Boards determine how predator control is to be conducted within their respective domains, and administer funds collected from the brand inspection fees (and other sources) for that purpose (WSS 11-6-210). Some choose to conduct their own programs with little or no Federal involvement.

The State Predatory Animal Advisory Board is made up of one representative from each County Predatory Animal Board, and provides general coordination, direction, and advice regarding predatory animal control operations across the State.

1.6.5 Wyoming Statutes - Animal Control Laws

Under Wyoming state law, any dog found in the act of killing or injuring livestock may be killed immediately (WSS 11-31-107). Dog control is generally the responsibility of local governmental agencies. Local animal control officials or County Sheriffs are responsible for dealing with dogs that threaten, damage or kill livestock. WS policy provides for WS to assist in dog damage management at the written request of local authorities and upon approval of the WS State Director.

1.6.6 U.S. Forest Service and Bureau of Land Management

The Forest Service and BLM have the responsibility to manage Federal lands for multiple-uses including livestock grazing, timber production, recreation and wildlife habitat, while recognizing the State's authority to manage wildlife populations. Both the Forest Service and BLM recognize the importance of managing wildlife damage on lands and resources under their jurisdiction, as integrated with their multiple-use responsibilities. For these reasons, both agencies have entered into MOUs with WS to facilitate a cooperative relationship. Copies of these MOUs are available by contacting the WS State Director's Office, POB 59, Casper, WY 82602.

1.6.7 U. S. Fish and Wildlife Service (USFWS)

The USFWS has the statutory authority to manage Federally listed T&E species through the Endangered Species Act of 1973 (ESA) (16 USC 1531-1543, 87 Stat. 884). Authorization, under Section 10 of the ESA, permits the USFWS to manage T&E species damage in accordance with the USFWS's plans (i.e., Interim Wolf Control Plan, Interagency Grizzly Bear Guidelines) and through MOU and Interagency Agreement. WS is authorized to assist the USFWS in reducing wolf predation to livestock on private and public lands.

1.6.8 COMPLIANCE WITH FEDERAL LAWS. Several Federal laws regulate WS wildlife damage management. WS complies with these laws, and consults and cooperates with other agencies as appropriate. Some of these laws are:

1.6.8.1 National Environmental Policy Act (NEPA) Environmental documents pursuant to NEPA must be completed before work plans consistent with the NEPA decision can be developed and

implemented. Before 1993, each National Forest (and occasionally individual Ranger Districts) and each BLM District would prepare its own NEPA document. This resulted in different requirements and procedures for different areas, and omitted analysis of WS activities on private lands. This EA, with WS as the lead agency, is the first time that all land classes under Cooperative Agreements, Agreements for Control and WS Work Plans will be analyzed in a comprehensive manner in the analysis area.

WS also coordinates specific projects and programs with other agencies. The purpose of these contacts is to coordinate any wildlife damage management that may affect resources managed by these agencies or affect other areas of mutual concern. Federal agencies that request WS assistance to protect resources not addressed in current NEPA documents are responsible for NEPA compliance.

1.6.8.2 Endangered Species Act (ESA) It is Federal policy, that under the ESA, *"All Federal agencies shall seek to conserve endangered species and threatened species and shall utilize their authorities in furtherance of the purposes of the Act"* (Sec.2(c)). WS conducts Section 7 consultations with the USFWS to use the expertise of the USFWS to ensure that, "*Any action authorized, funded or carried out by such an agency . . . is not likely to jeopardize the continued existence of any endangered or threatened species. Each agency shall use the best scientific and commercial data available"* (Sec.7(a)(2)). Wyoming WS conducted a consultation with the USFWS for Federally listed species in Wyoming to insure that the proposed action is unlikely to affect any listed species adversely.

1.6.8.3 Migratory Bird Treaty Act The Migratory Bird Treaty Act provides the USFWS regulatory authority to protect species of birds that migrate outside the United States. Following a determination by the Department of Justice, affirmed by the courts, that Federal agencies are not *"persons"* as defined by the Migratory Bird Treaty Act, USFWS no longer issues permits to Federal agencies such as WS for managing wildlife damage situations. The law prohibits any "*take*" of these species by private entities, except as permitted by the USFWS; therefore the USFWS issues permits to private entities for managing bird damage. WS provides on-site assessments for persons experiencing migratory bird damage to obtain information on which to base damage management recommendations. Damage management recommendations could be in the form of technical assistance or operational assistance. In severe cases of bird damage, WS provides recommendations to the USFWS for the issuance of depredation permits to private entities.

1.6.8.4 Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) FIFRA requires the registration, classification, and regulation of all pesticides used in the United States. The U.S. Environmental Protection Agency (EPA) is responsible for implementing and enforcing FIFRA. All chemical methods integrated into the WS program in the analysis area are registered with and regulated by the EPA and the WDA, and used by WS in compliance with labeling procedures and requirements.

1.6.8.5 National Historical Preservation Act (NHPA) of 1966 as amended The NHPA requires: 1) Federal agencies to evaluate the effects of any Federal undertaking on cultural resources, 2) 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.

1.7 PREVIEW OF THE REMAINING CHAPTERS IN THIS EA

The remainder of this EA is composed of four (4) chapters and three (3) appendices. Chapter 2 discusses and analyzes the issues and affected environment. Chapter 3 contains a description of each alternative, alternatives not considered in detail, mitigation and standard operating procedures (SOPs). Chapter 4 analyzes the environmental impacts associated with each alternative considered in detail, determines consistency with Forest Service LRMPs and BLM RMPs and determines the economic impacts of each alternative. Chapter 5 contains the list of preparers and

reviewers of this EA. Appendix A is the literature cited in the EA, appendix B is a glossary of terms and Appendix C are *Special Management Areas* in the analysis area.

CHAPTER 2: ISSUES AND AFFECTED ENVIRONMENT

2.0 INTRODUCTION

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

2.1 ISSUES ANALYZED IN DETAIL IN CHAPTER 4

The Multi-agency Team, consisting of representatives from the lead (WS) (40 CFR § 1501.5) and cooperating agencies (BLM, Forest Service, WGFD, WDA, WSLI) (40 CFR § 1501.6) determined the issues to be:

Issue 1. Cumulative impacts on the viability of wildlife populations.

- Potential for the WS take of predators to negatively impact recreational or commercial harvest of predators.

Issue 2. Effectiveness and selectivity of damage management methods.

- Potential for WS methods to take non-target animals.
- Need for a wide variety of damage management methods.
- Criteria for deciding what methods would be used.
- Use of "preventive" damage management.

Issue 3. Risks posed by damage management methods to the public and domestic pets

Issue 4. Concern about WS impacts on T&E species.

Issue 5. Cost-effectiveness of WS activities.

2.2 ISSUES USED TO DEVELOP MITIGATION

2.2.1 Wildlife Damage Management in Special Management Areas

A number of different types of areas exist on Federal lands within the analysis area that currently have a special designation and/or require special management consideration (Appendix C). These include wilderness (WAs) or primitive areas (PAs), Wilderness Study areas (WSAs), research natural areas (RNAs), areas of critical environmental concern (ACECs), and wild and scenic rivers (WSR). The special management required for these different areas varies considerably by designation, land administrator, and are governed by different legal authorities. WS Work Plans, developed by WS in cooperation with the land management agency described the type of damage management that would be permitted and any mitigation measures that apply to special management areas.

WAs or PAs are areas designated by Congress to be managed for the preservation of wilderness values. Currently, the only WAs in Wyoming are on National Forest System lands, and there are numerous WSAs under interim management on BLM that could be designated as WAs in the future. There is one RNA administered by the Forest Service, in the analysis area.
WS has conducted wildlife damage management in special management areas in the past. Recreationists and others interested in special management areas (particularly WAs) may consider these activities to be an invasion of solitude and that it may adversely affect the aesthetic quality of the wilderness experiences.

WS wildlife damage management is conducted (and is proposed to continue in the future) only in limited instances, when and where a specific need exists, only when allowed under the provisions of the specific WA designation, and with the concurrence of the land managing agency. WS activities in special management areas have historically been, and are expected to continue to be a minor part of the WS program. Restrictions on activities in Special Management Areas are listed in Chapter 3 under Mitigation.

Special Management Areas

WSAs are areas that have been studied for their potential to qualify as WAs and are currently awaiting Congressional designation. These are primarily BLM lands and managed according to the BLM's Wilderness Interim Management Handbook H-8550-1 in a manner that does not diminish their wilderness values (BLM 1995). However, this management does allow for continuation of most prior (non-land disturbing) activities and does not preclude wildlife damage management. Currently, all or parts of 3 WSAs occur on BLM lands within the analysis area (Appendix C), however, none of these were recommended to Congress as WAs. Wildlife damage management in these areas would be carried out according to guidelines and restrictions imposed by BLM H-8550-1 (BLM 1995) and BLM Manual 6830. Those lands officially designated as WAs would be managed according to the BLM's Wilderness Management Policy (BLM 1981).

RNAs are Federal lands managed for the protection of unusual, scientific, or special interest natural characteristics for research and education. There are no designated RNAs on BLM in Wyoming at this time, however, there is one RNA on one National Forest in the analysis area. BLM and Forest Service policy does not automatically exclude wildlife damage management within these areas.

ACECs ACECs are BLM lands for which special management was deemed necessary. However, it should be noted that the legal responsibility for designation and management for ACECs comes from the Federal Land Policy and Management Act (FLPMA) and is considerably different from either RNA or wilderness designations. FLPMA defines an ACEC as an area, "*Within the public lands where special management attention is required (when such areas are developed or used or where no development is required) to protect and prevent irreparable damage to important historic, cultural, or scenic values, fish and wildlife resources, or other natural systems or processes, or to protect life and safety from natural hazards*." ACECs can be and are designated for a wide variety of special management situations ranging from maintaining near pristine scenic quality to the management of a hazardous waste dump. ACEC's can be and are often designated for multiple-uses. ACEC designation does not, by itself, preclude wildlife damage management, instead, the individual management prescriptions developed and presented within a given ACEC management plan determines what is allowable.

There are a total of four existing ACECs within the analysis area. It is not expected that wildlife damage management would negatively affect resource values that prompted ACEC designation. Therefore, such activities would continue unless specifically excluded by a future plan.

WSR At this time, there are no WSRs designated in the analysis area. There are no WSRs that are currently recommended for designation on either BLM or Forest Service administered lands.

2.2.2 Humaneness of methods as used by WS

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. Schmidt (1989) indicated that vertebrate pest control for societal benefits could be compatible with animal welfare concerns, if *" . . . the reduction of pain, suffering, and unnecessary death is incorporated in the decision making process."*

Suffering has been described as a *" . . . highly unpleasant emotional response usually associated with pain and distress*." However, suffering *" . . . can occur without pain . . . ,*" and *" . . . pain can occur without suffering . . . "*(American Veterinary Medical Association (AVMA) 1987). Because suffering carries with it

the implication of a time frame, a case could be made for *" . . . little or no suffering where death comes immediately . . . "*(California Department of Fish and Game (CDFG) 1991), such as with WS lethal damage management techniques of shooting and M-44s.

Defining pain as a component in humaneness of WS methods appears to be a greater challenge than that of suffering. Pain obviously occurs in animals. Altered physiology and behavior can be indicators of pain, and identifying the causes that elicit pain responses in humans would *" . . . probably be causes for pain in other animals . . . "*(AVMA 1987). However, pain experienced by individual animals probably ranges from little or no pain to significant pain (CDFG 1991). Some WS control methods such as leg-hold traps and body snares, may thus cause varying degrees of pain in different animal species for varying time frames. At what point pain diminishes or stops under these types of restraint has not been measured by the scientific community.

Pain and suffering as it relates to WS damage management methods to capture animals has both a professional and lay point of arbitration. Wildlife managers and the public would both be better served to recognize the complexity of defining suffering, since *" . . . neither medical or veterinary curricula explicitly address suffering or its relief"*(CDFG 1991).

Therefore, humaneness appears to be a person's perception of harm or pain inflicted on an animal, and people may perceive the humaneness of an action differently. The issue of humaneness has two aspects in relation to the proposed action:

1. Animal welfare organizations and individuals are concerned that some methods used to manage wildlife damage exposes animals to unnecessary pain and suffering. Kellert and Berry (1980) in a survey of American attitudes toward animals related that 58% of his respondents, *" . . . care more about the suffering of individual animals . . . than they do about species population levels."* Research suggests that with some methods, such as restraint in leg-hold traps, changes in the blood chemistry of trapped animals indicate "*stress.*" Blood measurements showed similar changes in foxes chased by dogs for about five minutes as those restrained in traps (USDA 1994:3-81). However, such research has not yet progressed to the development of objective, quantitative measurements of pain or stress for use in evaluating humaneness.

2. Humaneness, as perceived by the livestock industry and pet owners, requires that domestic animals be protected from predators because humans have bred the natural defense capabilities out of domestic animals. It has been argued that man has a moral obligation to protect these animals from predators (Glosser 1993). Predators frequently do not kill larger prey animals quickly, and will often begin feeding on them while they are still alive and conscious (Wade and Bowns 1982). The suffering apparently endured by livestock or pets damaged in this way is unacceptable to many livestock producers and pet owners.

Thus, the decision-making process involves tradeoffs between the above aspects of pain and humaneness. An objective analysis of this issue must consider not only the welfare of a wild animal caught in a leg-hold trap, but also the welfare of the domestic animals that may continue to be injured or killed if the leg-hold trap were not being used. The challenge in coping with this issue is how to achieve the least amount of animal suffering with the constraints imposed by current technology and funding.

WS has improved the selectivity of management devices through research and development of such apparatuses as pan-tension devices for leg-hold traps to exclude smaller non-target animals and other device modifications such as breakaway snares to allow large animals to escape. Research is continuing to bring new findings and products such as electronic trap monitoring devices and capture device-mounted tranquilizing agents into practical use. Until new findings and products are found practical, a certain amount of animal suffering will occur where predator damage management occurs where non-lethal damage management methods are not practical or ineffective. Furthermore, if quantifying suffering were possible, it is possible that the actual net amount of animal suffering would be less under the proposed action (or any

other alternative involving the use of lethal methods) than under no control since suffering of livestock preyed upon by predators would be reduced if the action is successful.

WS personnel in the analysis area are experienced and professional in their use of management methods so that they are as humane as possible under the constraints of current technology. Mitigation measures/SOP used to maximize humaneness are listed in Chapter 3.

2.2.3 The public's concern about use of chemicals

Much of the public concern about the use of wildlife damage management chemicals is based on erroneous perceptions that WS uses non-selective, outdated chemical methodologies. The proposed WS chemical use includes: sodium cyanide in the M-44, carbon monoxide produced by the gas cartridge, sodium flouroacetate in the LPC and DRC 1339 for reducing raven damage. These chemicals are regulated by the EPA through the FIFRA, by the WDA, by the Wyoming Department of Environmental Quality (DEQ), by MOUs with Federal land managing agencies, and by ADC Directives. Based on a thorough Risk Assessment, APHIS concluded that when WS program chemicals are used following label directions, they are selective to target individuals or populations, and such use has negligible impacts on the environment (USDA 1994, Appendix P).

2.2.4 American Indian Concerns

Cultural Resources

The NHPA requires Federal agencies to evaluate the effects of any Federal undertaking on historic properties of religious and cultural importance to an Indian tribe and to consult with appropriate American Indian Tribes on the identification, evaluation, and treatment of such properties. The Native American Graves Protection and Repatriation Act of 1990 provides for protection of American Indian burial sites and establishes procedures for notifying Tribes of any new discoveries.

In consideration of American Indian cultural resource interests, the WS program contacted the following Tribes within the analysis area:

The Eastern Shoshone Tribe, Fort Washakie, Wyoming
The Northern Arapaho Tribe, Ethete, Wyoming
The Shoshone-Bannock Tribes, Fort Hall, Idaho
The Ute Indian Tribe, Fort Dushense, Utah
The Crow Tribe, Crow Agency, Montana

Each Tribe was requested to identify any cultural concerns relating to the proposed WS program and identify a contact person for the Tribe. The only Tribes that responded were the Northern Arapaho Tribe and the Crow Tribe. No specific concerns were expressed, but the Tribes did request to be kept informed of the EA process and decision.

In most cases, wildlife damage management has little potential to cause adverse effects to sensitive cultural resources. The areas where wildlife damage management would be conducted are small and pose minimal ground disturbance. The areas proposed for wildlife damage management are not in areas of high sensitivity for cultural resources and no American Indian burial sites are known to be present in damage management areas.

In the event that cultural materials are discovered during project implementation, work in the immediate area would be halted pending notification of WS supervisors, appropriate Federal land management agency, the State Historic Preservation Office (SHPO). Work would not resume at that site until the materials have been evaluated and adequate measures for their protection or collection have been taken.

2.2.5 Environmental Justice and Executive Order 12898 - *"Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations"*

Environmental Justice is a movement promoting 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. Fair treatment implies that no person or group of people should endure a disproportionate share of the negative environmental impacts resulting either directly or indirectly from the activities conducted to execute this country's domestic and foreign policies or programs. 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. (The Environmental Justice movement is also known as Environmental Equity -- which is the equal treatment of all individuals, groups or communities regardless of race, ethnicity, or economic status, from environmental hazards).

Environmental Justice is a priority both within USDA/APHIS and WS. Executive Order 12898 requires Federal agencies to make Environmental Justice part of their mission, and to identify and address disproportionately high and adverse human health and environmental effects of Federal programs, policies and activities on 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. WS developed a strategy that: 1) identifies major programs and areas of emphasis to meet the intent of the Executive Order, 2) minimize any adverse effects on the human health and environment of minority and low-income persons or populations, and 3) carries out the APHIS mission. To that end, APHIS operates according to the following principles: 1) promote outreach and partnerships with all stakeholders, 2) identify the impacts of APHIS activities on minority and low-income populations, 3) streamline government, 4) improve the day-to-day operations, and 5) foster non-discrimination in APHIS programs. In addition, APHIS plans to implement Executive Order 12898 principally through its compliance with the provisions of NEPA.

All WS activities are evaluated for their impact on the human environment and compliance with Executive Order 12898 to insure Environmental Justice. WS personnel use wildlife damage management methods as selectively and environmentally conscientiously as possible. All chemicals used by WS are regulated by the EPA through the FIFRA, the Wyoming DEQ, by MOUs with Federal land managing agencies, and by ADC Directives. Based on a thorough Risk Assessment, APHIS concluded that when WS program chemicals are used following label directions, they are selective to target individuals or populations, and such use has negligible impacts on the environment (USDA 1994, Appendix P). The WS operational program, discussed in this document, 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.

2.3 ISSUES NOT CONSIDERED IN DETAIL WITH RATIONALE

2.3.1 WS's impact on Biodiversity and Predator/Prey Relationships (Potential for WS's take of predators to result in population increases of rodents and rabbits, which might then increase agricultural damage.)

No WS wildlife damage management is conducted to eradicate a native wildlife species. WS operates following international, Federal and State laws and regulations enacted to ensure species viability. Any reduction of a local population or group would be temporary because migration from adjacent areas or reproduction would soon replace the animals removed (Henke 1992). The impacts of the current WS program on biodiversity are not significant nationwide, statewide, or in the analysis area (USDA 1994). The WS take is a small proportion of the total population as analyzed in Chapter 4.

The relationship between predators and rodent and rabbit population (predator/prey relationship) has been summarized in USDI (1979).

Rabbit and rodent populations normally fluctuate substantially in multi-year cycles. There are two basic schools of thought as to the factors responsible for these fluctuations. One is that rodent and rabbit populations are self-regulated through behavior, changes in reproductive capacity due to stress, or genetic changes (Chitty 1967, Myers and Krebs 1983). The other is that populations are regulated by environmental factors such as food and predation (Pitelka 1957, Fuller 1969).

Keith (1974) concluded that: 1) during cyclic declines in prey populations, predation has a depressive effect and as a result, the prey populations may decline further and be held for some time at relatively low densities, 2) prey populations may escape this low point when predator populations decrease in response to the reduced food base, and 3) since rabbit and rodent populations increase at a faster rate than predator populations, factors other than predation must initiate the decline in populations.

Wagner and Stoddart (1972) and Clark (1972) independently studied the relationship between coyote populations and jackrabbit (*Lepus californicus*) populations in northern Utah and southern Idaho. Both noted that coyote populations increased as jackrabbit numbers increased, but with a 1-2 year delay, suggesting that the prey population controlled the predator population, rather than the reverse.

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 did not affect 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 antelope fawns did not affect the rodent or rabbit population. At the relatively low levels of predator removal currently being sustained (see Section 4.2.1), it is unlikely that overall rodent or rabbit populations would increase in response to predator removal.

2.3.2 Impacts on wildlife populations caused by low-level flights during aerial hunting.

One concern expressed is that aerial hunting might disturb wildlife populations to the point that their survival and reproduction might be adversely affected. WGFD uses low-level fixed-wing airplane and helicopter flights routinely to census wildlife populations. Under the terms of the MOU between the WGFD and the Wyoming WS program, WS and WGFD consult and cooperate to identify areas that may be of concern for big game species. WS avoids flying in these areas, and if big game herds are encountered in other areas, flight crews move away if the animals are reacting to the aircraft. Likewise, if WS aircraft encounter any wild horse herds, the aircraft moves away if the animals are reacting to the aircraft. Aerial hunting by WS is primarily conducted in winter when snow cover allows for greater visibility of target animals and their tracks. Deer, elk (*Cervus canadensis*), and pronghorn antelope are occasionally seen and/or flushed during aerial hunting, however, WS avoids pursuing or harassing them by both policy and practice.

USDI-NPS (1995b) reviewed studies on the effects of aircraft overflights on wildlife. The 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 states 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 *chronic*, (i.e., they occur daily or more often over long periods of time). Chronic exposure situations generally involve areas near commercial airports and near military flight patterns. WS aerial hunting operations occur in relatively remote rangeland areas where tree cover is lacking or scattered to allow for visibility of animals from the air.

Some examples of species or species groups that have been studied with regard to this issue and WS's determination of potential impacts from aerial hunting overflights are as follows:

<u>Colonial Waterbirds</u>. Kushlan (1979) reported that low level (390 feet followed by a second flight at 200 feet) overflights of 2-3 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. WS aircraft are unlikely to be flown over such species in the analysis area because aerial hunting generally occurs in upland areas, primarily away from any riparian areas. Even if an overflight of a nesting colony occurred, it is apparent that little or no disturbance would result.

Greater Snow Geese. Belanger and Bedard (1989, 1990) observed responses of greater snow geese (*Chen caerulescens atlantica*) to man-induced disturbance on a sanctuary area and estimated the energetic cost of such disturbance. They observed that disturbance rates exceeding 2 per hour reduced goose use of the sanctuary by 50% the following day. They also observed that about 40% of the disturbances caused interruptions in feeding that would require an estimated 32% increase in nighttime feeding to compensate for the energy lost. They concluded that overflights of sanctuary areas should be strictly regulated to avoid adverse impacts. WS aerial hunting flights rarely, if ever, occur over wetland areas and in no way would involve chronic or repeated flights over such areas. Thus, disturbance of migrating snow geese or any other waterfowl should be minimal to non-existent.

Mule Deer. Krausman et al. (1986) reported that only three of 70 observed responses of mule deer (*Odocoileus hemionus*) to small fixed-wing aircraft overflights at 150 to 500 feet above ground resulted in the deer changing habitats. The 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. Mule deer are frequently seen from WS aircraft and are sometimes temporarily disturbed as evidenced by their running and avoidance behavior. However, it is apparent that adverse effects from this type of disturbance are minimal. WS aerial hunting personnel frequently observe deer and antelope standing apparently undisturbed beneath or just off to one side of aircraft. In areas exposed to periodic low-level aircraft, animals seem to acclimate to the aircraft to the point that disturbance is unapparent (L. Vetterman, Regional Aircraft Manager, WS, pers. comm. 1996). To the extent that localized coyote removal reduces predation on deer and antelope and other wildlife species, benefits to such species could outweigh potential adverse impacts.

While conducting aerial hunting operations on lands with cooperative agreements, WS flight crews have witnessed coyotes chasing deer and antelope in deep snow conditions (R. Phillips, State Director, WS pers. comm. 1996). To the extent that aerial hunting activities remove coyotes that might otherwise stress or kill wintering big game animals, this activity may have a beneficial effect.

Mountain Sheep. Krausman and Hervert. (1983) reported that, of 32 observations of the response of mountain sheep (*Ovis canadensis*) to low-level flights by small fixed-wing aircraft, 60% resulted in no disturbance, 81% in no or *"slight"* disturbance, and 19% in *"great"* disturbance. The authors concluded that flights less than 150 feet above ground can cause mountain sheep to leave an area. WS does not conduct aerial hunting in typical higher elevation mountain sheep habitat. If wild sheep are observed, the pilot avoids pursuit or harassment.

Bison. 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. Thus, in the event that wild bison are encountered by WS aircraft, impacts from disturbance should be minimal.

Raptors. Andersen et al. (1989) conducted low-level helicopter overflights directly at 35 red-tailed hawk (*Buteo jamaicensis*) nests and concluded their observations supported the hypothesis that red-tailed hawks habituate to low level flights during the nesting period. 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 (*Buteo 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). 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 *(Aquila chrysaetos)* were *"incredibly tolerant"* of overflights by military fighter jets, and observed that, although birds frequently exhibited alarm, negative responses were brief and never limiting productivity. These studies indicate that overflights by WS aircraft should have no significant adverse impacts on nesting raptor populations.

Aerial hunting is an important method of coyote damage management in the analysis area. As shown in the EA, section 1.0, WS has agreements to conduct predator damage management on about 45% of the analysis area. Put in perspective, the amount of aerial hunting that occurred in the analysis area was the equivalent of only 1.5 and 1.5 minutes of low-level flight per 1 $mi.^2$ during all of 1995 and 1996, respectively (MIS 1995b, 1996b).

Based on the above information and analysis, it is reasonable to conclude that WS's aerial hunting flights should not cause any significant adverse impact to non-target wildlife populations.

The WGFD annually conducts big game survey flights by helicopter. Survey flights require flying close enough and for long enough that observers can accurately count and identify sex of the animals present. The WGFD has monitored this situation to determine whether these flights may be negatively affecting those animals being surveyed. WGFD does not believe their surveys cause significant impacts to big game because surveys are routinely conducted only once a year, and they do not spend large amounts of time in any one area (Facciani 1997). Similarly, while WS may hunt the same area more than once a year, days, weeks, or even months may intervene between flights. Unless a coyote is being pursued, the airplane typically just flies over the area. Some big game animals may run for a short distance, but once they realize they are not being pursued they usually stop and watch the aircraft as it leaves the area. Other big game animals in the same group may not react to the aircraft enough to rise from a *"bedded"* position. Because of the infrequency of aerial hunting flights and limited time spent in any area, WS does not believe aerial hunting causes a significant impact to big game. The WDA issues aerial hunting permits to private aerial hunters in Wyoming according to Federal law. The WDA has only received one complaint in six years from the public about this lawful practice (Micheli 1997).

2.3.3 Livestock losses are a cost of doing business and the need to consider a threshold of loss.

Some commenters felt that livestock producers should expect some level of loss as a cost of doing business, and that WS should not initiate any damage management until economic losses reach some predetermined "*threshold*" level. Although some losses of livestock can be expected and tolerated by livestock producers, WS has a legal responsibility (Animal Damage Control Act of 1931, as amended (46 Stat. 1486; 7 U.S.C. 426-426c), Rural Development, Agriculture, and Related Agencies Appropriation Act of 1988) to respond to requests for wildlife damage management, and it is program policy to aid each requester to minimize losses. If damage management efforts are not initiated soon after a damage problem is detected, damages may sometimes escalate to excessive levels before the problem is solved.

In the Southern Utah Wilderness Alliance, et al. vs. Hugh Thompson, Forest Supervisor for the Dixie National Forest, et al., the United States District Court of Utah denied plaintiffs' motion for preliminary injunction. In part, the court found that a forest supervisor needs only show that damage from predators is threatened to establish a need for wildlife damage management (U.S. District Court of Utah 1993).

2.3.4 No wildlife damage management at taxpayer expense, wildlife damage management should be fee based.

During public involvement, some respondents felt that wildlife damage management should not be provided at the expense of the taxpayer or that it should be fee based. Funding for WS comes from a variety of sources besides Federal appropriations. WDA general funds, livestock producer funds, county funds, and WGFD funds are all applied to the program under Cooperative Agreements. Federal, State and local officials have decided that WS should be conducted by appropriating funds. Additionally, wildlife damage management is an appropriate sphere of activity for government programs, since wildlife management is a government

responsibility. WS was established by Congress as the program responsible for providing wildlife damage management to the people of the United States.

2.3.5 Appropriateness of manipulating wildlife for the benefit of hunters or recreation and an EIS needs to be prepared because of the benefit to wildlife.

Some individuals felt that manipulating one wildlife species for the benefit of another wildlife species or for the benefit of hunters or recreation was not appropriate. This is an individual perception; the jurisdiction for managing most resident wildlife rests with the WGFD. Predator damage management for the protection of any wildlife species would only be conducted after a request has been received from the WGFD and based on needs they identify. An EIS is required only when a beneficial impact is determined by the action agency to be *"significant"* in terms of the criteria contained in the Council on Environmental Quality (CEQ) NEPA Implementing Regulations (40 CFR § 1508.27). The proposed action includes predator damage management for game species enhancement if the WGFD, USFWS or an American Indian Tribe identifies the need for and requests such activity to meet management goals. Populations of game species, such as deer, pronghorn antelope, or migratory birds, are cyclic depending on weather and other habitat and mortality factors, including predation. Any increases in a localized population, that result from predator damage management, would be within those cyclical limits that can occur without any predator damage management programs and would thus not be *"significant"* in terms of NEPA.

In addition, the regulation (40 CFR §1508.27(b)(9)) does not suggest an EIS is required because of the presence of T&E species, but requires a determination of the degree to which a proposed action may adversely affect such Federally listed species. The EA presented information on T&E species, addressed potential impacts in Chapter 4 and referenced or prescribed mitigation measures already in place as a result of WS's SOPs or established as a result of ESA Consultation with the USFWS. The analysis supports a conclusion of no significant impact regarding T&E species.

2.3.6 Appropriateness of using rancher-supplied data to quantify livestock losses.

Some individuals believe that ranchers often intentionally overestimated the extent of their livestock losses to justify more lethal predator damage management. 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 Wyoming sheep producers between 1992 and 1995 amounted to about 61% (range 52.3 to 63.9%) of the total reported death loss (WAS 1996). Through intensive monitoring conducted during a study on three typical range sheep operations in southern Idaho, Nass (1977) found that predation was responsible for 56% of the total death losses. This data suggests that attributing an average of 61% of total death losses to predation is realistic, and that Wyoming sheep producers are not intentionally overestimating their predation losses.

2.3.7 Relocation (rather than killing) of problem wildlife.

Relocation may be appropriate in some situations (i.e., if the problem species' population is at very low levels, there is a suitable relocation site, and the additional funding required for relocation can be obtained.) However, those species that often cause damage problems (i.e., coyotes, red fox, raccoon, skunk) are relatively abundant in much of the suitable habitat in the analysis area, 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 for black bears and mountain lions in Wyoming, could also require payment of damage compensation claims (WSS Title 23, Article 9, 23-1-901). Any decisions on relocation of black bears or mountain lions are coordinated with local WGFD officials, and relocation of wolves is conducted by the USFWS.

The AVMA, The National Association of State Public Health Veterinarians, and the Council of State and Territorial Epidemiologists all opposes the relocation of mammals because of the risk of disease transmission, particularly for small mammals such as raccoons or skunks (Center for Disease Control 1990). Although relocation is not necessarily precluded in all cases, it would often be logistically impractical and biologically unwise.

2.3.8 Appropriateness of preparing an EA (instead of an EIS) for such a large area.

Some individuals questioned whether preparing an EA for an area as large as about 12.4 million acres would meet the NEPA requirements for site specificity. If in fact a determination is made through this EA that the proposed action would have a significant impact on the human environment, then an EIS would be prepared (40 CFR § 1501.3 and § 1501.4). In terms of considering cumulative impacts and *ecosystem management*, one EA covering the entire analysis area should provide a better analysis than multiple EAs covering smaller zones and presenting more fragmented or segmented data analysis.

APHIS NEPA implementing procedures allow for individual wildlife damage management actions of the kind described in the EA to be categorically excluded from the requirements for preparation of either an EIS or EA (7 CFR § 372.5 (c), 60 Fed. Reg. 6,000-6,003). Nevertheless, this EA was prepared to evaluate and determine if any potentially significant impacts occur to the human environment from the proposed action. EAs were prepared by the BLM to assess the potential impacts of WS's predator damage management on the Casper and Rawlins Districts (BLM 1994a, 1994b). EAs were also prepared by the Big Horn National Forest (Forest Service 1993). All of these EAs resulted in a Finding of No Significant Impact (FONSI). The U.S. Department of the Interior, Office of Hearings and Appeals, Interior Board of Land Appeals (IBLA) (IBLA 1997) concluded on an appeal of the Worland BLM District Animal Damage Control Plan (EA-WY-015-EA4-047) filed by the Native Ecosystems Council that, "*On the basis of its* (BLM) *EA, an agency makes a FONSI upon the quality of the human environment*, (and) *no EIS is necessary*."

2.3.9 WS work on private versus public lands.

Some individuals expressed concern about how WS activities would be conducted on private versus public lands. WS activities on private lands are carried out only after the landowner/administrator has requested services from WS and after an *Agreement for Control on Private Property* has been signed. This agreement stipulates which methods may be used on the property. WS activities on public lands are only carried out after development of work plans between WS 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 activities on public lands are typically carried out under more restrictions than on private land to mitigate the likelihood of conflicts with users of public lands.

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

Although no law or policy requires livestock producers to employ good husbandry practices to protect their livestock, most Wyoming sheep producers do employ a variety of husbandry practices and non-lethal damage management methods to protect their sheep as a matter of good business. In 1995, 100 % of the analysis area sheep producers that cooperate with WS used non-lethal predator damage management measures to protect sheep. About 59% of the analysis area sheep operations that cooperate with WS, for example, use guard animals to protect their flocks (Wyoming WS unpubl. data), and **all** range sheep producers employ herders to stay with the sheep. Most requests for assistance to protect sheep from predation come from producers who are already employing non-lethal control measures but experience predation problems in spite of these practices. WS policy is to respond to all requests for assistance within program authority and responsibility. If improved husbandry practices or additional non-lethal methods would likely reduce a predation problem, WS makes recommendations regarding these practices.

2.3.11 Qualifications of WS personnel.

One commenter questioned the qualifications of WS personnel carrying out predator damage management activities. WS employees are experienced in the use of a wide variety of damage management methods, and are provided training on use of firearms, aerial hunting, and use of pesticides and immobilization/ euthanasia drugs. All Wyoming WS personnel using pesticide products are certified and licensed by the WDA as commercial pesticide applicators; personnel that use immobilizing or euthanizing chemicals are trained and certified to use each chemical authorized by WS and the Food and Drug Administration (FDA).

2.3.12 Appropriateness of WS preparing this EA, rather than the Forest Service or BLM.

Under the terms of a 1993 MOU between APHIS and the Forest Service, and a 1995 MOU between APHIS and the BLM, APHIS-WS is recognized as the agency with the authority and expertise to conduct wildlife damage management. The Forest Service, BLM and WS all recognize that WS is responsible for NEPA compliance related to any wildlife damage management conducted by WS. The Forest Service and BLM cooperated with WS in the preparation of NEPA documents addressing WS's activities on lands administered by these two agencies.

2.3.13 Need for public awareness and education.

Some individuals suggested that there was a need to educate the public regarding WS activities and the need for wildlife damage management. Although this is a recognized need, WS does not require each State administered program to undertake efforts to promote public understanding of this issue. Wyoming WS personnel, however, do participate in *AG in the Class Room* throughout Wyoming, conduct presentations to high school and college students, and provide instructional sessions or presentations as requested by individuals or organizations.

2.3.14 Livestock losses are a tax "write off"

There is a belief that livestock producers receive double benefits by having a partially publicly funded program to resolve predation problems and also receive deductions as a business expense on tax returns. The Internal Revenue Service tax code (Internal Revenue Code, Section 1245, 1281) does not allow for livestock losses to be *"written off"* if the killed livestock were produced on the ranch. About 85% (MIS 1996) of predation occurs to young livestock (lambs and calves) in the analysis area. Many ewes and cows are added to herds as young livestock as replacements for breeding stock, and if lost to predation they cannot be *"written off"* since they were not purchased. These factors limit the ability of livestock producers to recover against economic losses. Producers do not receive double benefits by having a Federal program to manage wildlife damage and Federal tax deductions for predation losses.

2.3.15 Wildlife populations need to be monitored

WS's proposed action is to reduce or minimize wildlife damage to livestock, property, wildlife, and to safeguard public health and safety in the analysis area. The Wyoming WS program, in cooperation with the WGFD, monitors the impact on target species in the analysis area and statewide to determine if the total take is within allowable harvest levels. WGFD harvest and population census/survey/modeling data would be used to determine the impact of total take on predator species.

2.3.16 WS Causes Genetic Loss in the Subspecies of Coyotes Found in Wyoming

To assess the concern about coyote subspecies and loss of genetic material, it is necessary to understand what a "subspecies" is. A subspecies is a morphologically distinguishable group whose members are at least partially isolated geographically, but interbreed successfully with members of other subspecies of the same species where their ranges overlap. Scientists often use other terms, such as race and variety, as synonyms for the word "subspecies" (Connolly 1994). If crossbreeding occurs in nature in places where the geographic ranges of two kinds of mammals meet, the two kinds are considered subspecies of one species. If no crossbreeding occurs, the two kinds are regarded as two distinct species. Coyotes are regarded as predators

with generalized feed habits that allow them to inhabit wide variety of habitat types. They are considered widely distributed throughout most of North America and highly mobile, migrating over large areas, and it is generally recognized that interbreeding of subspecies occurs, invalidating subspecies classifications (Voigt and Berg 1987). In other words, the animals are morphologically indistinguishable and are so much alike that a trained wildlife biologist could not tell one subspecies from another (Connolly 1994). Young and Jackson (1951) wrote of the great amount of individual color, size and cranial characteristic variations of coyotes, and stated that the actual limits of the geographic range of any subspecies cannot be indicated by sharp and fast lines. They also indicated that, within the range of one subspecies, individual coyotes will be found that are typical of other subspecies.

There are two subspecies of coyotes found in Wyoming, *Canis latrans latrans* (Plains coyote)and *C. l. lestes* (Mountain coyote). The mountain coyote is one of the most widely distributed subspecies, occurring throughout the Great Basin of the U.S. and north into British Columbia and Alberta (Connolly 1994). Young and Jackson (1951) stated that, *The subspecies* "*lestes*." *shows clear intergradation with all races adjoining it distributionally, and often borderline specimens are difficult to determine over a considerable range."* This means that the average person looking at a coyote on or near the edges of the published geographic range of the mountain coyote would find it difficult or impossible to tell if the animal was, in fact, a mountain coyote, or a member of another subspecies.

The WS take of coyotes is limited to areas where cooperative agreements or work plans are in place. Wyoming WS personnel normally remove only a small percentage of the total coyote population, as analyzed in Chapter 4 of this EA, and therefore do not nor has not had an impact on genetic variability of the coyote population. There is no indication that either of the coyote subspecies occurring in Wyoming is scarce or rare. In keeping with CEQ direction (*agencies should discuss only briefly issues other than significant ones*) (40 CFR § 1500.49(c) and (*agencies shall avoid useless bulk in statements and concentrate effort and attention on important issues)* (40 CFR § 1502.15) WS is in compliance with this direction.

2.3.17 By Removing Coyotes in an Area Causes Younger More Aggressive Coyote to Inhabit the Area, Thus Causing Greater Livestock Losses

Two studies (Connolly et al. 1976, Gese and Grothe 1995) investigated the predatory behavior and social hierarchy of coyotes, and determined that the more dominant (alpha) animals were the ones that initiated and killed most of the prey items. Connolly et al. (1976) concluded from pen studies, with known aged coyotes, that the proclivity of individuals that attacked livestock seemed related to their age and relationship with conspecific. The coyotes that attacked sheep most frequently were the dominant males and females paired with these males, with the males responsible for the majority of the attacks and kills. Gese and Grothe (1995) concluded from observing wild coyotes that the dominant pair was involved in vast majority of predation attempts. The alpha male was the main aggressor in all successful kills, even when other pack members were present. A phenomenon observed by WS personnel over many years involves the wounding and maiming of lambs in late summer (usually August and September) by pups of the year being trained to hunt/kill by the alpha pair. In these instances, one or two lambs may be killed cleanly by the adults, and several more will be bitten on the throat, nose, ears, etc., by pups that lack the experience and strength to kill cleanly. These maimed lambs usually die, in spite of medical attention, because of infections, fly maggots in the wounds, and shock (R. Phillips, State Director, WS pers. obs. 1996) Thus, it appears the above concern is unfounded because removal of local territorial (dominant) coyotes removes the individuals that are most likely to kill livestock and generally results in the immigration of subdominant coyotes that are less likely to kill livestock during that particular grazing season.

2.3.18 WS's removal of coyotes may increase livestock depredation problems.

This argument was raised in *Southern Utah Wilderness Alliance* v. *Thompson* (U.S. District Court of Utah 1993) and addressed by Connolly (1992b) during that court case. What happens in an unexploited coyote population bears little relevance to the situation in Wyoming or in most other areas of the U.S. As noted in

the EA, coyote populations in Wyoming are subject to mortality not only from WS, but also from natural mortality, private trappers and hunters as well as ranchers protecting their livestock.

WS is unaware of any scientific data that would prove speculation about unexploited coyote populations posing less risk to livestock than exploited populations. Where monitoring was conducted, in areas were there were organized predator damage management efforts, losses to sheep from coyotes typically range from 1.0 to 6.0% for lambs and 0.1 to 2.0% for ewes (USDI 1978). In situations where producers were reimbursed for their losses in lieu of predator damage management efforts (Henne 1975, Munoz 1977, McAdoo and Klebenow 1978, Delorenzo and Howard 1976, O'Gara 1983), losses from coyotes were typically greater, ranging from 12 to 29% of lambs and 1 to 8% of ewes. Windberg et al. (1997) demonstrated that coyotes from unexploited coyote populations readily kill livestock and selectively preyed on smaller goats. They determined that 41% of the kid goats exposed during the study were killed by predators. This remarkably high predation rate occurred despite no recent (>7 years) exposure to goats or sheep as prey on their study area. Windberg et al. (1997) noted that the high incidence of coyote predation on goats during their study with an unexploited coyote population that had very low reproductive efforts and was contrary to this theory.

As stated in the EA (3-6, 3-10, 4-18), WS predator damage management was effective in reducing lamb losses for 3 to 6 months and cost effective in areas where winter aerial hunting was conducted (Wagner 1997), while not adversely impacting coyote populations (EA 4-5). The U.S. General Accounting Office (GAO 1990) also concluded that according to available research, WS predator damage management efforts have been effective in reducing damage losses. Guthery and Beasom (1978) demonstrated that predator damage management can substantially increase the survival of vulnerable livestock. In their study, predators were responsible for most of the known losses, with the true predation loss as high as 95% for a kid goat crop. The EA cites many of the same references that GAO reviewed to document the effectiveness of predator damage management.

Coyotes in areas of lower population densities, may reproduce at an earlier age and have more off spring per litter, however, these same populations generally sustain high mortality rates of adults and offspring. Therefore, the overall population of the area does not change. The number of breeding coyotes does not substantially increase in the absence of exploitation and individual coyote territories produce one litter per year independent of the population being exploited or unexploited. Connolly and Longhurst (1975) demonstrated 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. Thus, it appears the above concern is unfounded.

The EA also noted that without the Wyoming WS program, coyote damage management efforts would still likely be carried out by another entity.

2.3.19 WS needed to consider the phenomena of "mesopredator release" (i.e., in the absence of large predators, smaller predators such as foxes, raccoons and skunks, can become more abundant), and the potential for this to negatively impact bird species of special concern.

While the phenomena of mesopredator release has been documented in the absence of larger predators, this phenomena would not result from WS's predator damage management efforts as the analysis in Chapter 4 of the EA reveals. Trend information on the population status of predators taken by sport harvest or by WS indicate that those populations are healthy and generally stable or increasing throughout the State, with minor fluctuations from year-to-year, thus no major increase of "*mesopredators*" has been documented nor likely to occur because of WS predator damage management.

2.3.20 Concerns about the persistence of sodium monofluoroacetate in the environment, posing threats for scavengers, companion animals, T&E species, and humans.

Sodium monofluoroacetate is only used in the Livestock Protection Collar (LPC) and registered by the EPA (Reg. No. 565228-22) and the WDA for use in Wyoming by certified pesticide applicators and trained WS personnel. The LPC may only be used in fenced pasture to protect sheep and goats from predation by

coyotes and bobcats (*Lynx rufus*) and approval must be received from the USFWS prior to use to minimize risk to T&E species. Use and disposal of LPCs would be in accordance with the label and the *Technical Bulletin for the Sodium Fluoroacetate (Compound 1080) Livestock Protection Collar* (Connolly 1993). Warning signs are placed at logical points of access whenever the LPC is in use in a specific pasture to alert humans that the LPC is in use.

Hilton et al. (1969) noted that salts of monofluroacetic acid exhibited a high degree of absorption to root tissues and other cellulosic materials; therefore, any sodium monofluoroacetate released into the environment because of LPC use is not likely to be carried far by leaching water, but held in the upper soil layers. Horiuchi (1960) demonstrated that fluroacetamide breaks down in the soil. David and Gardiner (1966) demonstrated that both sodium monofluoroacetate and fluoroacetamide break down in the soil by microorganisms, and concluded that there are no apparent reasons for condemning the use of these compounds because of a buildup of toxic residues in the soil. Soil bacteria can decompose monofluoroacetate by cleaving the carbon-fluorine bond to yield fluoride ions and glycolate (Goldman 1965), and King et al. (1994) and Walker (1994) report that sodium fluoroacetate is decomposed in the soil by bacteria and fungi. Parfitt et al. (1994) demonstrated, by adding sodium monofluoroacetate to stream water and after aerial applications of sodium monofluoroacetate baits, that sodium monflouoracetate concentrations were very low to non-dectectable and did not persist in stream water samples taken and analyzed from baited areas.

The LPC was designed specifically to target coyotes which attack the throat of sheep or goats (Connolly 1990). Black vultures (*Coragyps atratus*), turkey vultures (*Cathartes aura*), common ravens (*Corvus corax*), black-billed magpies, red-tailed hawks, and striped skunks were observed feeding on collared sheep and goats killed by coyotes, but none were known to be poisoned by sodium monofluoroacetate (Connolly 1980). Scavengers generally avoid eating wool or hair that was contaminated following breakage of the collar and fed instead on uncontaminated tissues (Connolly 1980, Burns and Connolly 1995). In addition, when coyotes are killed as a result of puncturing an LPC, the level of contamination is so low that their tissues are not hazardous to scavengers (Connolly 1990, Burns et al. 1991). Secondary hazards posed by poisoned coyotes were studied by feeding their muscle and non-muscle soft tissues to skunks and magpies (Burns et al. 1984). No symptoms of toxicity were detected. Striped skunks, black-billed magpies and golden eagles were fed diets containing many times the average residue in coyotes killed with a LPC for 5 days (Burns et al. 1986, Burns et al. 1991). No deaths occurred, but some eagles showed symptoms of intoxication (Burns et al. 1991). Both skunks and eagles reduced their consumption of treated diets but resumed normal feeding on untreated diets and exhibited no adverse effects within a few days. Because these diets contained much higher concentrations of sodium monofluoroacetate than are found in carcasses of coyotes killed by LPCs, and because the dietary exposure in these pen studies was much greater than would occur under field conditions, it is concluded that carcasses of coyotes killed by sodium monofluoroacetate pose little if any hazard to these scavengers. Numerous research studies indicate the lack of effect on non-target species during extensive field use of LPCs (Walton 1992, Connolly 1993, Burns et al. 1991).

2.3.21 ADC must consider cumulative impacts from surrounding states.

The Wyoming WS Program coordinates its activities with the Forest Service, BLM, USFWS, WDA and the WGFD to insure no cumulative effects to any wildlife populations or other resources managed by these agencies. The National WS and Wyoming WS Program conducted an ESA Consultation with the USFWS to insure no adverse or cumulative impacts to T&E species, and Wyoming WS has consulted with the Wyoming Historical Preservation Office and American Indian tribes to insure no adverse impacts to historical or cultural resources. The intent of this coordination and consultation is to draw on the expertise of other agency and tribal personnel to insure there are no cumulative impacts, in Wyoming or surrounding states from WS predator damage management.

2.3.22 Predators contribute significantly to the natural control of wild horse populations

Only one study (Turner et al. 1992) was found that documented sufficient predation on wild horse (*Equus caballus*) populations to limit growth. In this study, a mountain lion (*Puma concolor*) population in central California depredated foals and young horses, but no evidence of predation on older horses was observed. Observations on wild horses in Montana and Wyoming indicate that predation does not occur at a level to contribute to the control of wild horse populations, particularly from coyotes and black bears (*Ursus americanus*) (L. Coates-Markle, Wild Horse and Burro Specialist, BLM, pers. comm. 1997). Historically, the only predator damage management in wild horse range conducted in Wyoming has been to reduce coyote damage to livestock. Wyoming WS traditionally has not conducted mountain lion damage management in Wyoming without a request from the WGFD.

2.3.23 Livestock Losses by Causes Other Than Predation.

WS is charged by the Animal Damage Control Act of 1931 as amended (7 U.S.C. 426-426c, Stat. 1468) and the Rural Development, Agricultural and Related Agencies Appropriated Act, (Public Law 100-202, Dec. 22, 1987. Stat 1329-1331, 7 U.S.C. 426c) to protect natural and agricultural resources, property, and safeguard public health and safety. A recent court decision determined that the mere threat of wildlife damage is reason enough to establish a WS program (U.S. District Court of Utah 1993). Livestock losses for reasons other than predation are not wildlife damage and for these reasons, livestock losses by causes other than predation are outside the scope of this EA.

2.4 Issues Outside the Scope of this Analysis.

1. Mad Cow Disease, and Hormones and Antibiotic Used in the Livestock Industry.
2. Delisting of Threatened and Endangered Species.
3. Establishing Hunting Quotas.
4. Development and Urbanization of Wildlife Habitat and Human Overpopulation.
5. Prairie Dog Control.
6. Prevent Bison from Wondering from Yellowstone National Park.
7. Wildlife and Livestock Research.
8. Threatened and Endangered Species Reintroductions, particularly Wolves and Grizzly Bears.
9. Establishment of Predator Management Units.
10. Contract with Private Trappers and Develop a State Administered Program.
11. Require Livestock Producers to Have Insurance for Livestock Losses.
12. Protected status of some predator species versus a less protected status for some game animals.

CHAPTER 3: ALTERNATIVES

3.0 INTRODUCTION

This chapter consists of four parts: 1) an introduction, 2) description of alternatives considered and analyzed in detail including the Proposed Action (Alternative 3), 3) a description of alternatives considered, but eliminated from detailed study, and 4) a discussion of mitigating measures and SOPs. This EA consists of seven alternatives that were identified, developed, and analyzed in detail by the Multi agency Team (WS, BLM, Forest Service, WGFD, WDA, WSLI); seven alternatives were considered but not analyzed in detail with supporting rationale. The seven alternatives analyzed in detail are:

1) Alternative 1 - Current Analysis Area WS Program: (No Action). This alternative consists of the current program of technical assistance and operational predator damage management by WS on Forest Service, BLM, State, county and private lands under Cooperative Agreement, Agreement for Control and work plans with WS.

2) Alternative 2 - No Federal Predator Damage Management in the Analysis Area (No Control). This alternative would terminate the Federal program for predator damage management on the WS analysis area.

3) Alternative 3 - Fully Integrated Wildlife Damage Management (IWDM) for Multiple Resources and Land Classes (as described in Alternative 1) (Proposed Action). This alternative would allow for predator damage management to be based on the needs of multiple resources (livestock, property, wildlife and public health and safety) and would be implemented following consultations with the WGFD, WDA, Federal agencies, or Tribal governments. The alternative would allow for the program to protect multiple resources on all lands within the analysis area, and for the use of M-44s on BLM lands within policies of the agencies and Work Plans, and the Livestock Protection Collar (LPC) on private lands.

4) Alternative 4 - Non-lethal Control Required Prior to Lethal Control. This alternative would require that livestock owners conduct non-lethal damage management measures prior to the initiation of WS lethal damage management.

5) Alternative 5 - Corrective Control Only. This alternative would require that livestock losses occur before to the initiation of WS lethal damage management. No preventive lethal damage management would be allowed.

6) Alternative 6 Technical Assistance Only. Under this alternative, WS would not conduct predator damage management in the analysis area. The entire program would consist of only technical assistance.

7) Alternative 7 - Predator Damage Management with Only Mechanical Methods (No Use of Chemicals). Under this alternative, WS would be restricted to using only mechanical damage management methods (i.e., traps, snares, aerial hunting, calling and shooting, shooting) with no chemical damage management methods allowed (i.e., DRC 1339, sodium cyanide, gas cartridge, LPC, immobilizing and euthanizing chemical agents).

3.1 DESCRIPTION OF THE ALTERNATIVES

3.1.1 ALTERNATIVE 1 - Current Analysis Area WS Program: (No Action)

The No Action alternative is a procedural NEPA requirement (40 CFR §1502.14(d)), is a viable and reasonable alternative that could be selected, and serves as a baseline for comparison with the other

alternatives. The No Action Alternative, as defined here, is consistent with CEQ's definition (CEQ 1981).

The No Action alternative would continue the current WS predator damage management program in the analysis area. The current program is a collection of cooperative programs with other Federal, State and local agencies, and private individuals and associations to protect livestock, property, wildlife, and public health and safety (described in Chapter 1). WS personnel in the analysis area conduct technical assistance, preventive (in response to historical loss) and corrective (in response to current loss or hazard) operational predator damage management using a full array of legally available predator damage management methods. The methods for WS's use include: traps, snares, aerial hunting, calling and shooting, shooting, DRC 1339, gas cartridge and M-44s. M-44s are not currently used on BLM lands because the current EAs restrict their use. WS activities are conducted on National Forest System, BLM, State, county and private lands under MOU, Cooperative Agreements or Agreement for Control. All predator damage management is based on interagency relationships, which require close coordination and cooperation because of overlapping authorities and legal responsibilities.

On Federal lands, WS Work Plans describe the wildlife damage management that would occur. During the WS work planning process with the BLM or Forest Service, and WGFD and WDA, plans and maps are prepared or updated which describe and delineate where predator damage management would be conducted and which methods would be used. Before management is conducted on private lands, *Agreements for Control on Private Property* would be signed with the landowner or administrator that describe the methods to be used and the species to be managed. Management is directed toward localized populations or groups, and/or individual offending animals, depending on the circumstances and species.

3.1.2 Alternative 2 - No Federal Predator Damage Management in the Analysis Area.

This alternative would eliminate all WS or any other Federal program for predator damage management (operational and technical assistance) on all land classes within the analysis area. However, State and county agencies, and private individuals could conduct predator damage management. WS would not be available to provide technical assistance or make recommendations to individuals or entities experiencing predator damage. In some cases, control methods applied by non-agency personnel could be used contrary to their intended or legal use, or in excess of what is recommended or necessary. Illegal use of pesticides could increase (Schueler 1993).

A *No Control* alternative was analyzed by the USFWS EIS (USDI 1979) and was dismissed as an invalid alternative. However, due to interest in this option, an analysis of this alternative has been included. A *No Control* alternative was also evaluated in USDA (1994).

3.1.3 Alternative 3 - Fully Integrated Wildlife Damage Management (IWDM) for Multiple Resources and Land Classes (as described in Alternative 1) (Proposed Action).

This alternative is similar to the current program as described in Alternative 1. However, this alternative proposes to: 1) combine an WS livestock protection program with identified needs to protect designated wildlife species as requested by the WGFD and as coordinated with the WGFD, BLM and the Forest Service, 2) protect T&E species as requested by the WGFD and/or USFWS, 3) in addition to the methods described in Alternative 1, provide for the use of M-44s on BLM and National Forest System lands within the analysis area. Such use would not be BLM District or Forest wide, but would be contingent upon agency policy, safety, effectiveness, need and EPA use restrictions, and 4) provide for LPC use on private lands within the analysis area under the current WDA registration. Use of the LPC would follow EPA registration and WDA requirements, and would be restricted to specially trained and certified WS employees. Label restrictions limit use of the LPC to fenced pastures. 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 proposed predator damage management, including areas to receive damage management, timing of damage management and methods to be used would be selected based on the combined needs of livestock and wildlife resources, rather than just the needs of the livestock resources, mitigated by potential adverse impacts to wildlife. This strategy provides for more of an *ecosystem management* approach for areas where WS conducts predator damage management. For any specific area of public land, the WGFD would be invited to the work plan meeting between WS and the BLM or Forest Service. All predator damage management would be outlined in WS Work Plans based on close cooperation and coordination with each BLM District and National Forest. WS would identify areas where requests for assistance to protect livestock have been received or are anticipated (based on historic loss data). The WGFD or USFWS would identify areas where protection of wildlife may be necessary to achieve their management objectives, and any mitigation necessary to protect other wildlife resources. The land management agency, consistent with existing MOUs, would identify areas where other mitigation is necessary to protect resources under their jurisdiction. A damage management strategy would then be developed based on the combined resources need and mitigation requirements. Maps of each BLM District and National Forest showing the areas where predator damage management could be needed would be developed/updated utilizing information brought forth during work plan meetings.

3.1.4 Alternative 4 - Non-lethal Control Required Prior to Lethal Control.

This alternative would require requesters to conduct non-lethal damage management before the use of lethal damage management efforts by WS. Non-lethal methods selected by livestock producers would include livestock husbandry, habitat modification and animal behavior modification methods. Verification of the methods used would be the responsibility of WS. No standard exists to determine producer diligence in applying these methods, nor are there any standards to determine how many non-lethal applications are necessary before the initiation of lethal controls. Thus, only the presence or absence of non-lethal methods can be evaluated. The mechanical and chemical damage management methods described in Alternatives 1 and 3 would apply, where appropriate, once the criteria for non-lethal damage management have been met. Consideration of wildlife needs would not be included with the producer implemented non-lethal methods, nor would WS base damage management strategies on the needs of designated wildlife.

3.1.5 Alternative 5 - Corrective Control Only.

This alternative would provide for predator damage management only in places where damage/losses are occurring. Incumbent in this alternative is WS verification of the loss and the species responsible. Livestock producers would still implement non-lethal methods they determine to be practical and effective. Lethal damage management would be limited to an area near the loss to maintain the integrity of the corrective only situation. The full variety of mechanical and chemical damage management methods described in Alternatives 1 and 3 would be available, once losses have occurred and are verified.

3.1.6 Alternative 6 - Technical Assistance Only.

Under this alternative, Wyoming WS would eliminate operational predator damage management in the analysis area. WS would only provide technical assistance and make recommendations when requested. However, private landowners, contractors, or others could conduct their own wildlife damage management on Federal, State, county and private lands under the provisions of WSS 11-6-101, 11-6-102, 11-6-105, 13-3-115, and 23-3-114.

This *technical assistance only* alternative would place the immediate burden of operational control on State agencies, associations, individuals and requesters. Individuals experiencing wildlife damage would, independently or with WS recommendations would carry out and fund control activities. Individual livestock producers could implement wildlife damage management as part of the cost of doing business, or a State agency could assume a more active role in providing operational predator damage management.

If this alternative would be selected, WS could not direct how a State agency or individuals would implement predator damage management. Some agencies or individuals may choose not to take action to resolve predator damage. Other situations may warrant the use of legally available management methods because of public demands, mandates, or individual preference. Methods and control devices could be applied by people with little or no training and experience, and with no professional oversight or monitoring for effectiveness. This in turn could require more effort and cost to achieve the same level of problem resolution and could cause harm to the environment, including a higher take of non-target animals. The illegal use of pesticides could increase which would be extremely detrimental to wildlife (Schueler 1993).

3.1.7 Alternative 7 - Predator Damage Management With Only Mechanical Methods (No Use of Chemical Methods).

This alternative would only provide for predator damage management with the mechanical methods described under Alternative 1. These include livestock producer methods, such as animal husbandry, habitat modification, and animal behavior modification. Producers would be encouraged to use these methods based on the level of risk, need, and practicality. WS personnel would conduct predator damage management through the use of leg-hold and cage traps, neck and foot snares, ground shooting, aerial hunting, denning (without the use of gas cartridges), and using hunting dogs where signed *Agreements for Control on Private Property* are in place, or on Federal lands according to the provisions of WS Work Plans or other comparable document. For technical assistance requests, cage or leg-hold traps could be recommended or loaned to the requester for use in resolving problems.

3.2Predator Damage Management Strategies and Methodologies Used in the Eastern Wyoming Analysis Area.

Generally, the strategies and methodologies described below are common to Alternatives 1, 3, 4 and 5 of this EA. Under Alternative 1, no M-44 use would occur on BLM lands nor LPC use on private lands. Alternative 2 would terminate both WS technical assistance and operational predator damage management. Under Alternative 6, WS personnel would only make technical assistance recommendations. Only mechanical damage management methods would be used under Alternative 7. Alternatives 1, 3, 4, 5, 6 and 7 management strategies would be applied based on practical and legal strategies that are supported by the ADC Decision Model (Slate et al. 1992).

3.2.1 Integrated Wildlife Damage Management (IWDM)

During more than 80 years of resolving wildlife damage problems, WS has considered, developed, and used numerous methods of managing damage problems (USDA 1994, P. 2-15). The efforts have involved the research and development of new methods, and the implementation of effective strategies to resolve wildlife damage.

The most effective approach to resolving wildlife damage is to integrate the use of several methods simultaneously or sequentially. IWDM is the implementation and application of safe and practical methods for the prevention and reduction of damage caused by wildlife based on local problem analyses and the informed judgement of trained personnel. The WS Program applies IWDM, commonly known as Integrated Pest Management (ADC Directive 2.105), to reduce damage through the ADC Decision Model (Slate et al 1992) discussed on page 3-7.

The philosophy behind IWDM is to implement effective management techniques, in a cost effective manner while minimizing the potentially harmful effects to the public, 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. IWDM may incorporate cultural practices (i.e., animal husbandry), habitat modification, animal behavior (i.e., scaring techniques), 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[2], consideration is given to the:

- Local environmental conditions
- Potential biological, physical, economic, and social impacts
- Potential legal restrictions
- Species responsible
- Magnitude of the damage
- Geographic extent of damage
- Duration and frequency of the damage
- Status of target and non-target species, including T&E species
- Prevention of future damage (lethal and non-lethal techniques)

3.2.2 The IWDM Strategies Used in the Analysis Area Consist of:

3.2.2.1 Technical Assistance Recommendations (implementation is the responsibility of the requester): Analysis area personnel provide information, demonstrations and advice on available predator damage management techniques. Technical assistance includes demonstrations on the proper use of some management devices (propane exploders, electronic guard, cage traps, scarecrows, etc.) and information on animal husbandry, wildlife habits, habitat management and animal behavior modification. Technical assistance is generally provided 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, need and practical application. Technical assistance may require substantial effort by WS personnel in the decision making process, but the actual implementation is generally the responsibility of the requester.

3.2.2.2 Direct Damage Management (assistance conducted or supervised by WS personnel): Direct damage management assistance is implemented when the problem cannot be resolved through technical assistance and when cooperative agreements, work plans, or other comparable documents provide for WS direct damage management. The initial investigation defines the nature and history of the problem, extent of damage, and the species responsible for the damage. Professional skills of WS personnel are often required to effectively resolve problems, especially if restricted pesticides are proposed or if the problem is complex, requiring the direct supervision of a wildlife professional. WS considers the biology and behavior of the damaging species and other factors using the Decision Model (Slate et al 1992). The recommended strategy(ies) may include any combination of preventive and corrective actions that could be implemented by the requester, WS, or other agency personnel, as appropriate. Two strategies are available:

1. **Preventive Damage Management** is applying wildlife damage management strategies before damage occurs, based on historical problems and data. All non-lethal methodologies, whether applied by WS or livestock owners, are employed to prevent damage from occurring and therefore fall under this heading. When requested, WS personnel provide information and conduct demonstrations, or take action to prevent additional losses from recurring. For example, in areas where substantial lamb or calf depredations have occurred on lambing or calving grounds, WS may provide information about livestock guarding animals, fencing or other husbandry techniques, or if requested, conduct predator damage management before lambing or calving begins, if appropriate; black bear and mountain lion damage management is conducted after consultation and coordination with the WGFD.

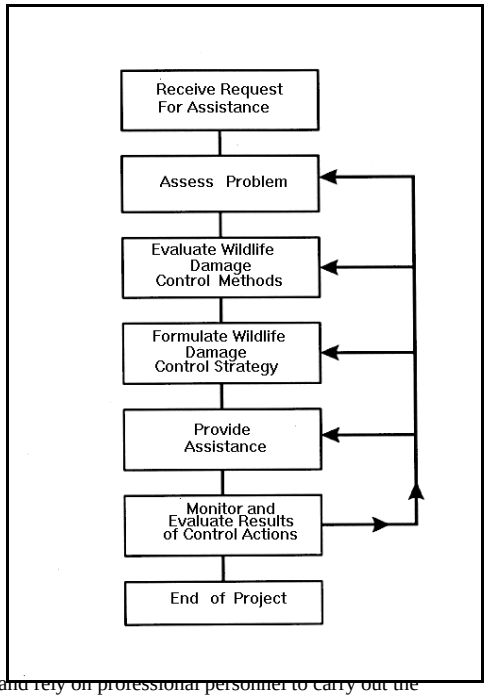
[2]The cost of damage management may sometimes be secondary because of overriding environmental, legal, public health and safety, animal welfare, or other concerns.

The rationale for conducting preventive damage management to reduce damage differs little in principle from holding depredation hunts for deer or elk in areas where agricultural damage has been a historical problem. By reducing the number of deer near agricultural fields, or the number of coyotes near a herd of sheep, the likelihood of damage is reduced.

Shelton and Klindt (1974) documented a strong correlation between coyote densities and levels of sheep loss in Texas, and Robel et al. (1981) found a similar correlation in Kansas. In southeastern Idaho, Stoddart and Griffiths (1986) documented an increase in lamb losses followed by a decrease in lamb losses as coyote populations rose and fell. Gantz (1990) concluded that late winter removal of territorial coyotes from mountain grazing allotments would reduce predation on sheep grazing on those allotments the following summer. Wagner (1997) determined that aerial hunting 3 to 6 months before sheep are grazed on an area was cost effective when compared to areas without aerial hunting. Wagner (1997) also determined that in areas where preventative aerial hunting was conducted, that fewer hours of subsequent ground work were required. She concluded that, *"The reduction of device nights as a result of aerial hunting represents a potentially significant reduction in the risk to non-target species because species other than coyotes can fall prey to traps, snares and M-44s."*

Preventive damage management could take place on private, county and State lands without special authorization at the request of the owner or lessee. For preventive damage management on Federal lands, historical loss areas are delineated on maps by representatives of the Federal agencies which identify areas where preventive damage management may occur. Management areas and techniques are reviewed during the work plan meeting between the appropriate agencies. Maps are available for public review at the appropriate Federal office. In addition, when conducting predator damage management on Federal lands, WS must receive a request from the individual or livestock owner experiencing the damage.

2. **Corrective Damage Management** Corrective damage management is applying predator damage management to stop or reduce current losses. As requested and appropriate, WS personnel provide information and conduct demonstrations, or take action to prevent additional losses from recurring [3]. For example, in areas where verified and documented lamb depredations are occurring, WS may provide information about livestock guarding animals, fencing or husbandry techniques, or conduct operational damage management to stop the losses. The U.S. General Accounting Office (GAO) concluded that, according to available research, localized lethal damage management is effective in reducing predator damage (GAO 1990).



3.2.3 Decision Model used for Decision Making

The WS EIS (USDA 1994: 2-20 to 31) and Slate et al. (1992) describe the decision making procedures used by WS personnel to determine management strategies or methods applied to specific damage problems.

The WS decision making process is a procedure for evaluating and responding to damage complaints (Figure 1).

[2]Requesters enter into a *Agreement For Control On Private Property* with WS, and rely on professional personnel to carry out the wildlife damage management deemed necessary.

WS personnel frequently are contacted **only** after requesters have tried several non-lethal techniques and found them to be inadequate for reducing damage to an acceptable level. WS personnel evaluate the appropriateness of strategies, and methods are evaluated in the context of their availability (legal and administrative) and suitability based on biological, economic and social considerations. Following this evaluation, the methods deemed to be practical for the situation are formed into a management strategy. After the management strategy has been implemented, monitoring is conducted and evaluation continues to assess the effectiveness of the strategy. If the strategy is effective, the need for management is ended. USDA (1994) provides detailed examples of how the WS Decision Model (Slate et al. 1992) is implemented for coyote predation to sheep on public and private lands.

On most ranches, predator damage may occur whenever vulnerable livestock are present, because no socially acceptable method or combination of methods that permanently stops or prevents predation are available. When damage continues intermittently over time, WS personnel and the rancher monitor and reevaluate the situation frequently. If one method or combination of methods fails to stop the damage, a different strategy is implemented.

In terms of the Decision Model (Slate et al. 1992), most damage management efforts consist of a continuous feedback loop between receiving the request and monitoring the results with the management strategy reevaluated and revised periodically.

3.2.4 Predator Damage Management Methods Used in the Eastern Wyoming Analysis Area

3.2.4.1 Livestock Producer Implemented Methods consist primarily of non-lethal 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. WS cooperates with the WDA and the Wyoming Cooperative Extension Service to offer technical assistance to producers on non-lethal methods and provides sources for livestock guarding dog procurement. Livestock producer practices recommended by WS include:

Animal husbandry generally includes modifications in the level of care or attention given to livestock that may vary depending on the age and class of the livestock. Animal husbandry practices include but are not limited to techniques such as livestock guarding dogs, herders, shed lambing, night penning, carcass removal, temporary fencing, etc.

Habitat modification alters habitats to attract or repel 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, clearing brushy or wooded areas in or adjacent to lambing or calving pastures may be appropriate to reduce available cover for predators. However, actions of this type may not be allowed on public lands. Further, any habitat modification must be approached with caution. For instance, while clearing brush and trees may reduce predation, it could also reduce habitat for desirable wildlife or lead to soil erosion.

Animal behavior modification refers to tactics that alter the behavior of wildlife and reduce predation. Animal behavior modification may use scare tactics or fencing to deter or repel animals that cause loss, damage, or threats [4]. Some but not all devices used to accomplish this are:

- Predator-proof fences
- Electronic guards

[4] Scare devices will often only produce the desired result for a short time period until wildlife individuals become accustomed to the disturbance (Pfeifer and Goos, Conover 1982).

- Propane exploders
- Pyrotechnics

3.2.4.2 Mechanical Management Methods:

Mechanical management methods are non-chemical predator damage management methods implemented by either livestock producers, private individuals or WS personnel. The methods consist primarily of tools or devices to repel, capture or kill a particular animal or local population to prevent or reduce resource damage. Mechanical methods may be non-lethal such as barrier fencing, frightening devices such as the siren/strobe device or the propane cannon, or lethal such as the M-44, shooting or neck snares. If WS personnel apply mechanical damage management methods directly on private lands, an *Agreement for Control on Private Property* must be signed by the landowner or administrator authorizing the use of each damage management method. On Federal lands, damage management would be conducted in accordance with a work plan that identifies areas where and times when damage management requests may be expected, based on livestock use and historic documentation of losses. Federal land managers are responsible for identifying, in the work plan, areas where other multiple use priorities may conflict with predator damage management activities. For technical assistance requests, traps may be recommended or loaned to the requester for resolving problems.

Leg-hold traps can be effectively used to capture a variety of mammals, but are used most often within the analysis area to capture coyotes and red fox. Two primary advantages of the leg-hold 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 to the leg-hold trap's selectivity. An additional advantage is that leg-hold traps can allow for the release of non-target animals, and the release or relocation of animals such as wolves.

Disadvantages include the difficulty of keeping traps operational during rainy, snowy, 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 leg-hold traps requires more workforce than some methods, but they are indispensable in resolving some depredation problems.

In FY 96, 71 coyotes (3.3% of the analysis area take) and 7 red fox (3.9% of the analysis area take) were captured in leg-hold traps.

Cage traps, typically constructed of wire mesh, are sometimes used or recommended to capture smaller animals such as raccoons or skunks. Larger cage traps constructed of sections of culvert pipe are sometimes used to capture 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 more wary species such as coyotes or wolves.

Snares 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.) and are easier to keep operational during periods of inclement weather than leg-hold 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 also allow for live capture of neck-snared animals. Wyoming WS incorporates the use of some *"break-away"* snares that allow larger non-target animals to break the snare and escape (Phillips 1996).

When resolving bear and mountain lion problems, WS personnel typically use spring-activated foot snares, and culvert or enclosure type cage traps. These techniques allow for chemical immobilization, marking and relocation of animals, or if necessary, euthanasia if the WGFD determines that relocation is not a viable option.

Ground shooting is highly selective for target species and may involve the use of spotlights, decoy dogs or predator calling. Removal of one or two specific animals by shooting in the problem area can sometimes provide immediate relief from a predation problem. Shooting is often tried as one of the first lethal damage management options because it offers the potential of solving a problem more quickly and selectively than some other options. Shooting may sometimes be one of the only damage management options available if other factors preclude the setting of equipment. Shooting with rifles or shotguns is used to manage livestock depredation problems and public health and safety hazards when lethal methods are determined appropriate.

Hunting dogs are essential to the successful tracking and capture of depredating bears and mountain lions to alleviate damage, or for public health and safety threats. Dogs are also trained and used for coyote damage management to reduce and 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.

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 in Wyoming. 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 pups. Removal of pups will often stop depredations even if the adults are not taken. When adults are taken and the den site is known, the pups are 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.)

Aerial hunting 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 hunting consists of visually sighting target animals and shooting them from the aircraft. Shooting results in a relatively quick and humane death. Local depredation problems can often be resolved quickly through aerial hunting. Cain et al. (1972) rated aerial hunting as "*very good*" in effectiveness for problem solving, safety, and lack of adverse environmental impacts. Smith et al. (1986) cited the cost-effectiveness and efficacy as benefits of aerial hunting for protecting pronghorn antelope from coyote predation. Connolly and O'Gara (1987) documented that at least 55% of the coyotes taken by aerial hunting in their study area were confirmed sheep-killing coyotes. Wagner (1997) stated that: 1) aerial hunting may be an especially appropriate tool as it reduces risks to non-target animals, 2) minimizes contact between damage management operations and recreationists, and 3) is an effective method for reducing livestock predation.

Good visibility is required for effective and safe aerial hunting operations and relatively clear and stable weather conditions are necessary. Summer conditions limit the effectiveness of aerial hunting 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 hunting activities. Aerial hunting is one of the most important coyote damage management methods available to WS in the analysis area. In FY 96, 1,228 coyotes (56.3% of the analysis area take) were taken by this method.

3.2.5 Chemical Management Methods:

All chemicals used by WS are registered under the FIFRA and administered by the EPA, Wyoming DEQ, and WDA Technical Services Division. All analysis area WS field personnel are certified and licensed as commercial pesticide applicators by the WDA Technical Services Division. The WDA requires pesticide applicators to adhere to all certification requirements set forth in the FIFRA. No chemicals are used on Federal, State, or private lands without authorization from the land management agency or property owner/manager (see Mitigation page 3-17 for a more detailed explanation). The chemicals and methods used and/or registered for uses are:

Sodium cyanide used in the M-44 device. The M-44 spring-activated cyanide ejector device was developed specifically for coyote damage management, is selective to reduce coyote, red fox, gray fox and feral dog predation (Reg. No. 56228-15), and also for protecting T&E species and for certain public health uses (Thomas 1986, Connolly 1988). Sodium cyanide, the active ingredient in M-44s, is used for many purposes in the United States, including agricultural, pharmaceutical, mining, and for industrial dyes. Sodium cyanide is odorless when completely dry, emits an odor when dampened, is strongly alkaline, and rapidly decomposes in the environment. In 1989, about 215 million pounds of sodium cyanide were used in North America (Knudson 1990) of which the WS Program nationwide used about 0.0001%. In 1996, about 11.5 ounces of sodium cyanide were used in the analysis area. This includes capsules discharged through *test-firing* of units by WS personnel (MIS 1996).

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 and an inert biological marker, and a 5-7 inch hollow stake. To set an M-44, a good location is found, the hollow stake is driven into the ground, and 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 a bait is applied to 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. A canid 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. Predators killed by M-44s present no secondary poisoning risks to other animals that may scavenge on the predator's carcass (USDA 1994, Appendix P: 269-271).

The M-44 can be used very effectively during winter months when leg-hold traps are more difficult to keep functional, and M-44s are typically more selective for target species than leg-hold traps. They may also be more economical as a damage management tool, because they do not have to be monitored as often as traps or snares.

The M-44 is very selective for canids because of the attractants used and the unique requirement that the device be triggered only by pulling straight upward. Dogs are susceptible to M-44s, and discretion would 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 would be used for corrective and preventive damage management on private lands where authorized by Agreement for Control and on State and Federal lands where authorized. WS personnel comply with the EPA label and 26 use restrictions (see USDA 1994, Appendix Q: 9-12), USDA reporting requirements, and reporting requirements of the FIFRA.

In FY 96, 242 coyotes (11.1% of the analysis area take) and 44 red fox (24.4% of the analysis area take) were taken with M-44s. No non-target animals were taken in the analysis area during FY 96 by M-44s. Five years of WDA records show that up to 305 M-44 devices are used on a monthly basis by private trappers, and yet only 11 non-target animals have been taken in that time, six of those being skunks (WDA 1996). Most M-44 use occurs on private lands.

<u>BLM Lands:</u> In recognition of WS's role as lead-agency in preparation of work plans and associated NEPA documents and decisions, BLM currently neither requires nor approves Pesticide Use Permits (PUPs) for WS M-44 use on BLM administered lands (BLM IM95-135, IB95-214). BLM is responsible, however, for cooperating with WS in the development and review of WS Work Plans affecting BLM lands and resources. This cooperation is to ensure that these plans are consistent with existing RMPs or MFPs, including identification of areas on BLM lands where mitigation or other restrictions may be needed to ensure public safety, appropriate protection of special status species, and land use plan conformance.

National Forest System Lands: Although at present no M-44s are used on National Forest System lands in the analysis area, none of the three Forest Service LRMPs prohibit their use. Currently, in National Forests in both Forest Service Regions 2 and 4, authorization would have to be procured from a delegated Forest Service Official. For example, in Forest Service Region 2, the Regional Forester has not delegated the authorization for the use of a restricted herbicide, pesticide, or predacide below that level. Should WS deem the use of M-44s to be practical and necessary, coordination with the appropriate Forest Service unit during preparation of the work plan would facilitate this authorization.

For both Forest Service and BLM administered lands, EPA M-44 Use Restriction No. 8 (in the 26 numbered restrictions) has direct applicability. This restriction states: *"The M44 device shall not be used: (1) in areas within national forests or other federal lands set aside for recreational use, (2) in areas where exposure to the public and family pets is probable, (3) in prairie dog towns, or, (4) except for protection of federally designated threatened or endangered species; in national and state parks, national or state monuments, federally designated wilderness areas, and wildlife refuge areas."*

State Lands: Authorization for use on State land would be obtained by contacting the Director of the State Land and Farm Loan Office who would authorize placement of M-44 devices subject to the applicator contacting the surface lessee. The question of placement is left with the lessee, who best knows the land use pattern (WSLI 1996).

The **Livestock Protection Collar (LPC),** is registered with the EPA (Reg. No. 56228-22) for producer or WS use nationwide. Before use in individual states, the registrant must receive approval from the agency within the state that oversees pesticide usage; WS has approval to use the LPC from the WDA. Use of the LPC would follow EPA registration and WDA requirements, and is restricted to specially trained and certified WS employees.

Sodium fluoroacetate (Compound 1080) is the toxicant in the LPC and has been used since World War II. 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 canines than to most non-target species (Atzert 1971, Connolly and Burns 1990). Sodium fluoroacetate is a white powder soluble in water and is very stable in solution; it would only be used in the LPC. Sodium fluoroacetate kills by disrupting the Krebs Cycle, which is the energy producing process for cells. Many EPA imposed restrictions apply to the use of LPC (Connolly 1993).

The individual small and large collars contain 1.1 oz. (30.4 grams) of a 1% solution of sodium fluoroacetate and 99% inert ingredients. The LPC is worn around the neck of lambs, and kills only the predator attacking collared lambs (Connolly et al. 1978, Johnson 1984, Burns et al. 1988). When LPC's are used, lambs or goats are made susceptible to attack to prompt target predators to attack collared animals (Blakesley and McGrew 1984, Scrivner and Wade 1986, Connolly and Burns 1990). LPCs consist of two pouches that are punctured when collared livestock are attacked and bitten on the throat by a predator. Upon puncturing the pouches, the offending animal ingests a small volume of the solution and dies a short time later. In this usage, sodium fluoroacetate has virtually no risk of secondary poisoning (USDA 1994, Appendix P).

The **gas cartridge**, comprised of 35% charcoal and 65% sodium nitrate, is registered as a fumigant by the EPA (Reg. No. 56228-21) and is used in conjunction with *"denning"* in the analysis area. When ignited, the cartridge burns in the den of an animal and produces large amounts of carbon monoxide, a colorless, odorless, tasteless, poisonous gas which kills animals in the den. The combination of carbon monoxide exposure and oxygen depletion kills the animals. This technique is used on State, county, private and Federal lands where authorized in the analysis area, where livestock killing can be attributed to food procurement for young (Till and Knowlton 1983, Till 1992). In the analysis area during FY 1995 81 coyote or fox dens were fumigated, and in FY 1996, 99 dens were fumigated.

DRC-1339 (3-chloro-4-methylbenenamine hydrochloride) is a slow acting avian toxicant that is rapidly metabolized and/or excreted after ingestion. Because of the rapid metabolism of DRC-1339 it poses little risk of secondary poisoning to non-target animals, including avian scavengers (Cunningham et al. 1979, Schafer 1984, Knittle et al. 1990). This compound is also 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 1981).

DRC-1339 is registered with the EPA (Reg. No. 56228-29) to reduce raven damage to newborn livestock, or to the eggs or young of wildlife species. DRC-1339 is incorporated into baits where ravens are killing or injuring livestock (Larsen and Dietrich 1970). The feeding habits of the birds are observed before placing any treated baits to reduce the risks to non-target animals. Corvids (ravens, crow, magpies) are opportunistic feeders and by determining when and where the birds are feeding, the baits are found more quickly and easily, thereby reducing the risks to non-target animals. Selective management would be applied because corvids learn to exploit a readily available food source and will continue to focus on that source until the availability declines.

No raven control projects have been conducted by WS in the analysis area.

Chemical Immobilization/Euthanasia. Several chemicals are used by WS for immobilization and euthanasia of animals. Selected analysis area WS personnel have received training in the safe use of authorized immobilization/euthanasia chemicals and are certified by WS. This training involves hands-on application of state-of-the-art techniques and chemicals.

Telazol™ (NADA 106-111), Ketaset™ (NADA 45-290), and Capture-All 5 are the immobilizing agents used by WS, and are approved by the FDA. Telazol, Ketaset, and Capture-All 5 are rapid acting, non-narcotic, non-barbiturate injectable anesthetic agents, having a wide margin of safety. All three drugs produce unconsciousness known as "*dissociative*" which in general terms means that reflexes needed to sustain life (breathing, coughing, swallowing, etc.) are not affected by the drugs. These agents are used to immobilize live-captured animals for relocation, or administered before euthanasia. Before using an immobilizing agent, the size, age, temperament, and health of the animal are considered. Immobilizing agents may also be used in tranquilizer darts fired from a aircraft to capture gray wolves. As other drugs are approved by the FDA and WS, they could be incorporated into the program within the analysis area.

Telazol is a combination of equal parts of tiletamine hydrochloride and zolazepam hydrochloride. The product is generally supplied sterile in vials, each containing 500 mg of active drug, and when dissolved in sterile water has a pH of 2.2 to 2.8. Telazol produces a state of unconsciousness in which protective reflexes, such as coughing and swallowing, are maintained during anesthesia. Schobert (1987) listed the dosage rates for many wild and exotic animals. Following a deep intramuscular injection of Telazol, onset of anesthetic effect usually occurs within 5 to 12 minutes. Muscle relaxation is optimum for about the first 20 to 25 minutes after the administration, and then diminishes. Recovery varies with the age and physical condition of the animal and the dose of Telazol administered, but usually requires several hours.

Ketaset is supplied as a slightly acidic solution (pH 3.5 to 5.5) for intramuscular injection. Ketaset also produces a state of unconsciousness that interrupts association pathways to the brain and allows for the maintenance of the protective reflexes, such as coughing, breathing, swallowing, pedal and eye blinking. Ketaset is detoxified by the liver and excreted by the kidney.

Following administration of recommended doses, animals become immobilized in about 5 minutes with anesthesia lasting from 30 to 45 minutes; depending on dosage, recovery may be as quick as 4 to 5 hours or may take as long as 24 hours; recovery is generally smooth and uneventful.

Xylazine is a sedative which produces a transitory hypertension followed by prolonged hypotension, and respiratory depression. Recommended dosages are administered through intramuscular injection immobilizing the animal in about 5 minutes and lasting from 30 to 45 minutes.

Capture-All 5 is a combination of **Ketaset** and **Xylazine**, and is regulated by the FDA as an investigational new animal drug. The drug is available, through licensed veterinarians, to individuals sufficiently trained in the use of immobilization agents. Capture-All 5 is administered by intramuscular injection; it requires no mixing, and has a relatively long shelf life without refrigeration, all of which make it ideal for the sedation of various species.

Potassium chloride, a common laboratory chemical, could be used by WS personnel as a euthanizing agent after an animal has been anesthetized (ADC Directive 2.430).

3.3 ALTERNATIVES CONSIDERED BUT NOT ANALYZED IN DETAIL WITH RATIONALE

Several alternatives were considered but not analyzed in detail. These are:

3.3.1 Compensation for Predator Damage Losses

The Compensation alternative would direct all WS program efforts and resources toward the verification of losses from predators, and providing monetary compensation. WS would not provide any direct services nor would technical assistance or non-lethal methods be available.

This option is not currently available to WS because WS is directed by Congress to protect American agricultural and natural resources, property, and human health and safety (Wildlife Services Act of 1931, and Rural Development, Agricultural and Related Agencies Appropriation Act of 1988). Analysis of this alternative in the USDA (1994) indicates that it has many drawbacks:

- It would require larger expenditures of money and personnel to investigate and validate all losses, and determine and administer appropriate compensation.
- Compensation would most likely be below full market value.
- It is difficult to make timely responses to all requests to assess and confirm losses, and many losses could not be verified.
- Compensation provides less incentive to livestock owners to limit predation through improved animal husbandry practices and other management strategies.
- Not all ranchers would rely completely on a compensation program and unregulated lethal control of predators would most likely continue as permitted by State law.
- Congress has not appropriated funds to compensate for predation or other wildlife damage to agricultural products.

3.3.2 Bounties

Payment of funds for killing predators (bounties) suspected of causing economic losses is not considered effective by the WGFD (J. Lawson, WGFD, pers. comm. 1997). WDA officials have stated that bounties can be a useful tool for population reduction, but that care must be used to ensure safeguards are in place to prevent abuse (R. Micheli, WDA, pers. comm. 1997). This alternative will not be considered in detail by WS because:

- WS does not have the authority to establish a bounty program.
- Bounties are generally not as effective in reducing damage because depredating individuals/local populations are not specifically targeted.
- Circumstances surrounding take of animals is completely unregulated.
- No effective process exists to prohibit taking of animals from outside the damage management area for compensation purposes.

3.3.3 Eradication and Suppression

An eradication alternative would direct all WS program efforts toward planned, total elimination of native predator species.

Eradication of unprotected predators, such as coyotes, is legal in Wyoming under WSS 11-6-101, 11-6-102, and WSS 23-3-103(a) but not supported by the WGFD, WDA or WS. This alternative will not be considered in detail by WS because:

- WS opposes eradication of any native wildlife species.
- WGFD opposes eradication of any native Wyoming wildlife species.
- WDA opposes eradication of any native Wyoming wildlife species.
- The eradication of a native species or local population would be extremely difficult if not impossible to accomplish and cost prohibitive.
- Eradication is not acceptable to most members of the public.

Suppression would direct WS program efforts toward managed reduction of certain localized populations or groups.

In localized areas where damage can be attributed to predation by specific groups, WGFD has the authority to increase hunting seasons and hunter tag quotas; WDA has the authority to control unprotected predators, such as coyotes. When a large number of requests for wildlife damage management are generated from a localized area, WS would consider suppression of the local population or groups of the offending species, if appropriate.

It is not realistic, practical, or allowable under present WS policy to consider large-scale population suppression as the basis of the WS program. Typically, WS activities in the analysis area would be conducted on a small portion of the area inhabited by the depredating species or the species causing a threat to public health or safety.

3.3.4 The Humane Society of the United States (HSUS) Alternative

The HSUS proposed an alternative that requires: 1) "*permittees evidence sustained and ongoing use of non-lethal/husbandry techniques aimed at preventing or reducing predation prior to receiving the services of the ADC Program*"; 2) "*employees of the WS Program use or recommend as a priority the use of appropriate non-lethal techniques in response to a confirmed damage situation*"; 3) "*lethal techniques are limited to calling and shooting and ground shooting, and used as a last resort when use of husbandry and/or non-lethal controls have failed to keep livestock losses below an acceptable level*"; and 4) "*establish higher levels of acceptable loss levels on public lands than for private lands*".

The components of this proposed alternative by the HSUS have been analyzed in detail in the alternatives contained in this EA, in the Northern Utah Predator Damage Management EA (USDA 1996a) and through court rulings (U.S. District Court of Utah). The HSUS alternative would not allow for a full range of IWDM techniques to resolve predator damage management problems. In addition, WS is directed by Congress to protect American agricultural and natural resources, property, and public health and safety despite the cost of damage management (Animal Damage Control Act of 1931, as amended; and the Rural Development, Agricultural and Related Agencies Appropriation Act of 1988). Further, in the Southern Utah Wilderness Society et al. v. Hugh Thompson et al. U.S. Forest Service (U.S. District Court of Utah 1993) the court clearly states that, "*The agency need not show that a certain level of damage is occurring before it implements an WS program. . . .*Hence, *to establish need for an ADC, the forest supervisors need only show that damage from predators is threatened*." In other words, it is not necessary to establish a criterion, such as percentage of loss of a herd to justify the need for an WS. The alternatives and option selected for detailed analysis in this EA include many of the suggestions in the HSUS proposal, and it is

believed that inclusion of this alternative would not contribute new information for consideration and analysis that are not already being considered and available in IWDM as used by WS.

3.3.5 Provide Economic Incentives for Herd Protection

Providing economic incentives for a herd protection alternative would direct WS program efforts and resources toward the verification of herd protection methods and providing monetary compensation to the producers. WS services would not include direct damage management nor would technical assistance, or non-lethal methods be available.

This option is not currently available because WS is directed by Congress to protect American agricultural and natural resources, property, and public health and safety (Animal Damage Control Act of 1931, as amended; and the Rural Development, Agricultural and Related Agencies Appropriation Act of 1988).

Analysis of this alternative indicates that it has many drawbacks:

- It would require larger expenditures of money and workforce to investigate and validate all protective methods, and to determine and administer appropriate compensation.
- Making prompt responses to all requests to assess and confirm herd protection would be difficult, and losses could occur when and if the protection methods failed to adequately protect the livestock.
- Not all ranchers would rely completely on a herd protection/compensation program and unregulated lethal control of predators would most likely continue as permitted by State law.
- Congress has not appropriated funds to compensate livestock producers for herd protection or other wildlife damage to agricultural products.

3.3.6 No Wildlife Damage Management within any Wilderness or Proposed Wilderness Area

Under the current and proposed WS programs (Alternatives 1 and 3), the amount of predator damage management that would occur in WAs 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. The minor amount of predator damage management that is conducted by WS in WAs or proposed WAs conforms to legislative and policy guidelines as administered by the responsible land management agency. WS and the land management agency meet regularly to review work plans that delineate what, when, and where wildlife damage management would be conducted. Mitigations specific to this issue are listed at the end of Chapter 3.

3.3.7 Transfer the Present Wyoming WS Program to the WDA

This alternative would transfer the Federally administered Wyoming WS program to the WDA and consist of transferring all field and administrative activities including technical assistance and direct control. The conveyance of the Federal responsibility and funding to the WDA could only occur after a U.S. Congressional Directive allowed for such an action. Many other unresolved factors dealing with this alternative also include: 1) personnel and equipment transfers, 2) management and administration of the program, 3) proposed control methodologies, and 4) NEPA responsibilities, etc., under a State managed program. Given the myriad of unknowns surrounding this alternative and the fact that WS would not be part of such a program, this alternative will not be analyzed further.

3.4 Management Techniques Not Considered for Use in the IWDM Strategy

3.4.1 Guarding Animals Other Than Livestock Guarding Dogs

Besides livestock guarding dogs, that are widely used to protect livestock from predators, several other species of animals have been proposed as livestock guardians. Burros, llamas and emus have been advocated for this purpose, but their efficacy and practicality have not been established (Green 1989,

Franklin and Powell 1994). Research is continuing in this area, however, at this time WS does not believe the use of guarding burros, llamas and emus can be recommended for general use. As research provides proven preventive guarding animal methodologies, they will be incorporated into the list of recommended techniques. To some degree, hazards may exist to wild ungulates from the use of llamas for this purpose. Llamas are sometimes carriers of paratuberculosis (Johne's disease) which may be transmissible to native ungulates or domestic livestock (Wildlife Management Institute 1995). This disease involves a chronic wasting of the intestinal tract and associated lymphoid tissues, and there is no known cure.

3.4.2 Lithium Chloride as an Aversive Agent

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; Horn 1983; Johnson 1984; Burns and Connolly 1980, 1985). In addition, lithium chloride is currently not registered for this use by the EPA or WDA, and therefore cannot legally be used or recommended for this purpose.

3.5 Mitigation and Standard Operating Procedures (SOPs) For Wildlife Damage Management

Mitigation measures are any features of an action that serve to prevent, reduce, or compensate for impacts that otherwise might result from that action. The current WS program, nationwide and in Wyoming, uses many mitigation measures and these are discussed in detail in Chapter 5 of the WS EIS (USDA 1994). The following mitigation measures apply to some or all of the alternatives, as indicated in the columns. Mitigation measures for Alternatives 2 and 6 are listed together since the mitigation for these alternatives is similar.

Mitigation Measures	1	2/6	3	4	5	7
Activities in Wilderness and Special Management Areas (BLM and National Forest System Lands)						
Wildlife damage management would follow guidelines as specified and agreed upon in WS Work Plans, or other comparable documents.	X		X	X	X	X
Vehicle access would be limited to the same restrictions as the land management agency.	X		X	X	X	X
Predator damage management would be conducted only when and where a need exists.	X		X	X	X	X
No aerial hunting would be conducted in any WAs unless authorized.	X		X	X	X	X
No toxicants would be used in WAs or other special management area unless authorized.	X		X	X	X	X
No preventive damage management would be conducted in any WA unless authorized.	X		X	X	X	X
Should any of BLM's existing WSAs be officially designated as WAs, wildlife damage management would be performed according to BLM Wilderness Management Policy (BLM 1981) and the designating legislation.	X		X	X	X	X
Animal welfare and humaneness of methods used by WS						
Research would continue to improve the selectivity and humaneness of management devices and these would be implemented into the Wyoming						

Mitigation Measures	1	2/6	3	4	5	7
WS Program.	X		X	X	X	X
Pan-tension devices would be used to reduce the incidence of non-target animals captured in leg-hold traps.	X		X	X	X	X
Break-away snares have been developed and implemented into the program. (Breakaway snares are designed to break open and release with tension exerted by larger non-target animals such as deer and livestock.)	X		X	X	X	X
Chemical immobilization and euthanasia procedures that do not cause unnecessary pain are used.	X		X	X	X	X
Traps and snares would be checked at intervals consistent with State of Wyoming regulations.	X		X	X	X	X
Safety concerns regarding WS's use of toxicants, traps and snares						
All pesticides used by the Wyoming WS program are registered with the EPA and WDA.	X		X	X	X	
EPA-approved label directions are followed by WS employees.	X		X	X	X	
The Decision Model, designed to identify the most appropriate wildlife damage management strategies and their impacts, would be used when planning WS activities.	X		X	X	X	X
Most use of toxicants would be restricted to private lands.	X		X	X	X	
WS employees that use pesticides would be trained to use each specific material and would be certified to use pesticides under approved certification programs.	X		X	X	X	
WS employees who use pesticides would participate in continuing education programs to keep abreast of developments and to maintain their certifications.	X		X	X	X	
Traps and snares would be placed so that captured animals would not be readily visible from designated recreation roads or trails shown on Forest Transportation Maps, or from Federal, State, or county roads.	X		X	X	X	X
Warning signs would be posted on main roads and/or trails leading into areas where traps, snares or M-44s were being used. These signs would be removed at the end of the damage management period.	X		X	X	X	
In addition to area warning signs, individual warning signs would be placed within 25 feet of each M-44 device.	X		X	X		

Mitigation Measures	1	2/6	3	4	5	7
					X	
No M-44 devices would be used in designated bird hunting areas on public land during the regular upland bird hunting seasons.	X		X	X	X	
No traps, snares, or M-44s would be allowed within ¼ mile of any residence, community, or developed recreation site, unless requested by the owner of privately-owned property or an official from the appropriate land management agency.	X		X	X	X	X
Concerns about impacts of WS's activities on T&E species and other Species of Special Concern						
WS has consulted with the USFWS regarding the Wyoming WS program and would continue to implement all applicable measures identified by the USFWS to ensure protection of T&E species.	X		X	X	X	X
All cage (culvert) traps and foot snares set for black bears in areas *"occupied by grizzly bears"* would be checked at least daily.	X		X	X	X	X
Neck snares would not be used for coyotes, black bears or mountain lions in areas identified by the WGFD as *"occupied by grizzly bears*."	X		X	X	X	X
All leg-hold traps would be checked at least daily in areas identified by the USFWS as *"occupied gray wolf range".*	X		X	X	X	X
M-44s would not be used in areas identified by USFWS as *"occupied gray wolf range".*	X		X	X	X	X
Only break-away neck snares would be used in *"occupied gray wolf range"* between May and September unless they were set specifically to capture a wolf as a target species.	X		X	X	X	X
Only WS personnel trained in wolf identification would be used as aerial gunners in areas where gray wolves may be encountered.	X		X	X	X	X
No leg-hold traps or snares would be set within 30 feet of any exposed bait or animal carcass (except when attempting to catch bears or mountain lions) to preclude capture of bald eagles or other raptors.	X		X	X	X	X
Leg-hold traps or snares set near exposed baits to capture bears or mountain lions would incorporate tension devices to preclude capture of bald eagles and other non-target species.	X		X	X	X	X

Mitigation Measures	1	2/6	3	4	5	7
T&E species and "Species of Special Concern" would be addressed during the work planning process with State and Federal agencies.	X		X	X	X	X
If wintering big game are encountered during aerial hunting operations and react to the aircraft, the aircraft would leave the area.	X		X	X	X	X
Bear and mountain lion damage management would be restricted to offending individuals.	X		X	X	X	X
The use of non-lethal methods such as guard dogs, scare devices, llamas, and other methods, would be encouraged when appropriate.	X		X	X	X	X

CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

4.0 INTRODUCTION

Chapter 4 provides information needed for making informed decisions on the issues and affected environment addressed in Chapter 2 and the predator damage management alternatives discussed in Chapter 3. The chapter consists of: 1) assessment of the consistency of alternatives with existing management plans, 2) analysis of the environmental consequences of each alternative, and 3) an economic analysis of predator damage management in the analysis area.

4. 1 Alternative Consistency with Forest Service and BLM Management Plans.

Before an Alternative could be considered for implementation on National Forest System or BLM lands, it must be consistent with the land management and/or resource management plans. These are termed Land and Resource Management Plans (LRMP) or more commonly *"Forest Plans"* in the Forest Service; on BLM lands, the equivalent documents are called Resource Management Plans (RMP). If the Alternative is consistent with the LRMP or RMP no additional action would be necessary should that alternative be selected.

If an alternative that is inconsistent with the LRMP or RMP is selected in the decision process, the LRMP or RMP could be amended to be consistent with the EA or the alternative(s) modified to be consistent. The Decision would not be implemented on the National Forest System or BLM lands until the inconsistency is resolved.

The Forest Service and BLM recognize that State wildlife and fish agencies are responsible for the management of wildlife and the Federal land management agencies are responsible for the management of habitat (FSM 2603.2, FLPMA). It is Forest Service and BLM policy to allow predator damage management when there is: 1) a threat to public health or safety, or 2) unacceptable damage to T&E animals or plants, other wildlife, livestock or other resources, or public or private property.

The following is a review of the consistency with existing LRMPs and RMPs:

4.1.1 Forest Service LRMPs

4.1.1.1 Bighorn National Forest LRMP

The Bighorn NF has determined that Alternative 2 of this EA (No Control) would be inconsistent with the LRMP because of the potential need for predator damage management. The LRMP states objectives for deer and elk populations may be achieved only through the use of predator damage management. The LRMP does not have objectives regarding the number of livestock that would be grazed, though an upper limit of livestock grazing is stated. Forest Service policy allows predator damage management for the protection of T&E species, livestock, property and to safeguard public health and safety.

4.1.1.2 Medicine Bow National Forest LRMP

The Medicine Bow NF and Thunder Basin National Grassland LRMP reflects a General Direction of Management of Animal Damage. Specific direction to *"prevent or reduce damage"* connotes an active cooperative role with *"other appropriate agencies"* to accomplish this general direction. The only alternative this pro-active direction appears inconsistent with is Alternative 2, No Control.

4.1.1.3 Black Hills National Forest LRMP

The recently revised LRMP indicates a recognition of active protection activities. Protection of *"activities taking place on National Forest System lands"* while also, "protecting National forest System resources" is mentioned. The LRMP also indicates a cooperative relationship with other governmental agencies

conducting protection activities as a STANDARD. Alternative 2, No Control, would appear to be inconsistent with the active approach.

In summary, all three National Forest LRMPs reflect or indicate some forms of pro-active recognition of wildlife damage management. A *"No Control"* alternative is not consistent with a recognized *"need for management"* approach.

As all three LRMPs were accomplished and approved into execution during the early to mid-1980's, their language reflects the policy of Forest Service Manual 2650 (Animal Damage Management) at that time. Since the 1993 Forest Service and APHIS-WS MOU established a change of roles in NEPA compliance and responsibility for preparing work plans, some language may need adjustment. The May 1995 revision of Forest Service Manual 1650 reflects this change in roles. In many, if not most cases, the LRMPs may have some language that speaks to a *"work plan"* and does not specify the preparer. This could likely remain in place, with the new MOU and new FSM 2650 guiding the preparation of documents to APHIS-WS. Another item from the early to mid-1980's is reference to USFWS, USDI, as the parent agency of WS. This has changed to USDA. Various NFs will be unlikely to amend this departmental change in assignment, but will defer such a correction to major revision of their LRMP.

4.1.2 Bureau of Land Management District RMPs

4.1.2.1 Rawlins BLM District RMPs

The implementation of predatory animal damage control within the District is in conformance with the District's land use plans, (i.e., the Lander Resource Management Plan (RMP/FEIS) (BLM 1986, p. 30), the Great Divide Resource Management Plan Record of Decision (BLM 1991, p. 45)). The No Control (Alternative 2) would not be consistent with the RMP.

4.1.2.2 Casper BLM District RMPs

The actions proposed in this document are in conformance with the following land use plans: Buffalo Resource Management Plan (RMP), Buffalo resource Area; Platte River RMP, Platte River Resource Area; and the Newcastle Management Framework Plan, Newcastle Resource Area. It should also be noted that they are in conformance with the Draft EIS for the Newcastle RMP (second draft issued 1997).

4.2Environmental Consequences

This section analyzes the environmental consequences using Alternative 1 (the current program) as the baseline for comparison with the other alternatives to determine if the real or potential impacts are greater, lesser or similar. Table 4-8 summarizes a comparison of the issues and impacts of each Alternative.

The following resource values within the analysis area (i.e., soils, geology, minerals, water quality/quantity, flood plains, wetlands, visual resources, air quality, prime and unique farmlands, aquatic resources, timber and range, and cultural, archeological, and historic resources) would not be significantly impacted by any of the alternatives analyzed. These resources will not be analyzed further.

4.2.1 Social and Recreational Concerns: Social and recreational concerns are discussed throughout the document as they relate to issues raised during public involvement, and are discussed throughout USDA (1994). Recreationists and others interested in special management areas, particularly WAs, could consider predator damage management to be an invasion of solitude and that it could adversely affect the aesthetic quality of the wilderness experience. WS predator damage management is conducted and is proposed to continue only in limited instances when and where a specific need exists, only when allowed under provisions of the specific wilderness designation, and with the concurrence of the land managing agency. WS activities in special management areas have historically been, and are expected to continue

to be a minor part of the overall WS program. Restrictions on activities in WAs and WSAs are listed in Chapter 3 under Mitigation.

4.2.2 Cumulative and Unavoidable Impacts: Cumulative and unavoidable impacts are discussed in relationship to each of the key wildlife species and the environmental impacts are analyzed in this chapter. This EA recognizes that the total annual removal of individual animals from wildlife populations by all causes is the cumulative mortality. Analysis of the State *"takes"* during FY93, FY94 and FY95, in combination with other mortality, indicates that cumulative impacts are not significant. It is not anticipated that the proposed action would result in any adverse cumulative impacts to T&E species, or to WSAs or WAs.

4.2.3 Irreversible and Irretrievable Commitments of Resources: Other than relatively minor uses of fuels for motor vehicles and electrical energy for office maintenance, there are no irreversible or irretrievable commitments of resources. Based on these estimates, the analysis area program produces negligible impacts on the supply of fossil fuels and electrical energy.

4.3 Issues Analyzed in Detail

4.3.1 Cumulative Impacts on the Viability of Wildlife Populations - (Potentials for WS Take of Predators to Negatively Impact Recreational or Commercial Harvest of Predators.)

The species evaluated in this chapter were selected for analysis because they are taken by WS in response to livestock, property and wildlife predation, or public health threat situations. Analysis of this issue will be limited primarily to coyotes, red fox, striped skunks, badgers, raccoons, bobcats, black bears, and mountain lions. Although WS has not historically targeted ravens for lethal damage management in the analysis area, reduction of raven damage is included as a potential component of the current program and the proposed action, and potential impacts to this species' population are addressed as well.

The WGFD is the state agency responsible for protecting and preserving fish, big game, trophy game, and furbearer populations (WSS 23-1-101, 23-1-302). WGFD harvest regulations are subject to public review and comment before they are adopted by the Game and Fish Commission. In a typical year, the WGFD hosts several dozen local public meetings and eight major public hearings to discuss harvest regulations. Harvest regulations provide for public recreation and assist in controlling wildlife populations in order to reduce conflicts with a variety of human land uses.

Due to the biology of trophy game animals and furbearers, and the quotas imposed on harvest of trophy game, it is unlikely that either sport harvest or harvest by WS personnel to reduce depredations will significantly impact local or statewide population viability. WS personnel do not take black bears and mountain lions unless the WGFD requests assistance, and furbearer harvest by WS personnel is not large enough to affect population viability (Harju 1996).

The "*Magnitude*" analyses for this EA follow the process described in USDA (1994 Chapter 4) as outlined in Table 4-2, when applicable. Magnitude is defined in USDA (1994) as, ". . . *a measure of the number of animals killed in relation to their abundance*." Magnitude may be determined either quantitatively or qualitatively. Quantitative analysis is used wherever possible as it is more rigorous and is based on allowable harvest levels, population estimates and harvest data when applicable. Qualitative analysis is based on population trends and harvest data or trends and modeling. Allowable harvest levels were determined from research studies which are cited in USDA (1994, Table 4-2) as well as other research not cited in USDA (1994). *"Other Harvest"* includes the known fur harvest, sport harvest, and other information obtained from the WGFD and WDA. *"Total Harvest"* is the sum of the WS kill and the *"Other Harvest."* Other unreported mortality (i.e., disease, natural mortality, road kill, etc.) occur and are considered in the analysis.

Estimating wildlife densities is not precise, often dynamic and professional judgement is required to account for unknowns and variables, such as the ability of habitat to support populations. Therefore, when assessments are used, they are based on conservative population estimates rather than higher population estimates to better insure that no adverse wildlife population impacts occur.

4.3.1.1 Alternative 1 - Current Analysis Area WS Program: (No Action).

Coyotes typically are responsible for the largest portion of predation losses inflicted on livestock producers in the analysis area. During the 3-year period of 1993-1996, for example, an average of 71.9% of the predator-caused losses to sheep and lambs in Wyoming were caused by coyotes (WAS 1997). Most of WS's predator damage management efforts are therefore directed at coyotes, and WS takes more coyotes than any other predator species. Coyotes are responsible for about 91.7% of the verified and 98.9% of the reported analysis area dollar losses. WS County Summary Reports (MIS 1996) indicate that the coyote is reported to be the primary predator on sheep (100%), lambs (93.9%), cattle (100%) and calves (97.2%). The total WS verified loss to coyotes in the analysis area during FY 95 was valued at $45,146 (MIS 1996).

Coyote Population Information

To discuss the impacts of various environmental constraints and external factors on coyote populations and density, it is essential to understand the basic mechanisms that play a role in the coyotes' response to constraints and actions. The species unique resilience, its ability to adapt, and its perseverance under adverse conditions is commonly recognized among biologists and rangeland managers.

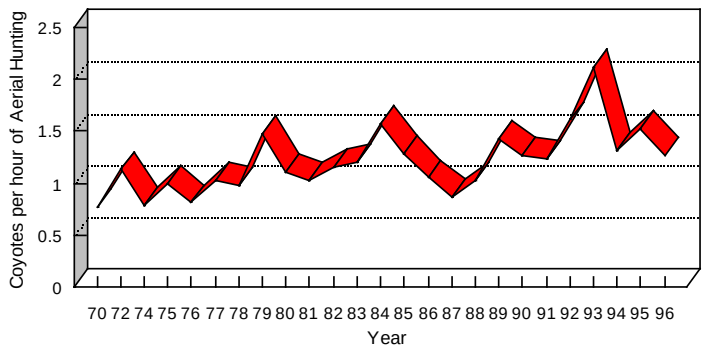
Absolute coyote population density determinations are frequently limited to educated guesses (Knowlton 1972). The cost of studies to accurately determine absolute coyote densities over large areas would be prohibitive (Connolly 1992b) and would not be warranted for this EA given the coyote's relative abundance. Coyotes are highly mobile animals with home ranges that vary by sex and age of the animal and season of the year (Pyrah 1984, Althoff 1978, Todd and Keith 1976), and the literature on coyote spatial organization is confusing (Windberg and Knowlton 1988, Messier and Barrette 1982). Coyote population densities 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/mi^2 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 significant predator damage management 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. Coyote home ranges may vary from 2.0 mi^2 to 21.3 mi^2 (Andelt and Gipson 1979, Gese et al.1988[5]). Gese et al. (1988) reported that resident annual coyote home ranges averaged: canyon - 2.1 mi^2, hill - 2.5 mi^2, pinyon-juniper-prairie - 4.1 mi^2, and prairie habitats - 6.3 mi^2. Ozoga and Harger (1966), Edwards (1975), and Danner (1976) however, observed a wide overlap between coyote home range and did not consider coyotes territorial.

For purposes of this analysis, data on WS's take of coyotes per hour of aerial hunting effort was assembled from historical program records (Figure 4-1). Minor year-to-year variation in the index may be attributable to differences in aerial hunting conditions (i.e., in years with more snow cover the average number of coyotes taken per hour might be higher than in years with less snow cover). The value of this information is in viewing it over time as a relative indicator of coyote abundance. Coyote abundance in

[5] All literature citations reported in km^2 have been converted to mi^2 for reader convenience and to maintain consistency.

the analysis area appears to be somewhat cyclical and the data suggests that Wyoming coyote densities are higher today than they were in the '70s, '80s and early '90s.
The presence of unusual food concentrations and non-breeding helpers at the den can influence territoriality and coyote densities, and complicate any effort to estimate abundance (Danner and Smith 1980, Shivik et al. 1996). A positive relationship was established between coyotes densities in mid-late winter and the availability of dead livestock (Roy and Dorrance 1985). Each occupied coyote territory may also contain several non-breeding helpers at the den (Allen, et al. 1987, Bekoff and Wells 1982). Therefore, each defended coyote territory may have more than just a pair of coyotes. Messier and Barrette (1982) reported that during 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 2, 3, 4, and 5 comprised 40%, 37%, 10% and 6% of the resident population, respectively. In addition, Shivik et al. (1996) observed non-resident coyotes crossing other coyote territories, apparently without aggressiveness directed at the non-resident coyote.

Figure 4-1. Aerial Hunting Index for Wyoming Coyote Populations
1970-1996



Based on the information cited above, coyote densities for purposes of this analysis will be estimated conservatively at 0.6/mi^2 throughout the analysis area. The analysis area would then hold an estimated coyote population of 11,625.

Coyote Population Impact Analysis

During 1994-95, WS took an average 2,544 coyotes annually in the analysis area, or about 21.9% of the estimated population (Table 4-3). Numbers of coyotes taken by private trappers are only available on a statewide basis. However, survey data collected by WGFD during the 1995-96 fur season suggests that about 28% of the statewide take occurred in the analysis area. For purposes of this analysis we will assume about 28% of the coyotes taken by private trappers were taken in the analysis area. The average annual private trapper harvest in the analysis area over the 1993-1994 and 1994-1995 seasons has been about 906 coyotes, and the average annual private aerial hunting take of coyotes from 1994 and 1995 has been about 230 coyotes. For purposes of this analysis, we will assume that the harvest by sport hunters equals the harvest by private trappers. The combined annual coyote take then probably averages about 4,586 coyotes in the analysis area, or about 40% of the estimated population. Although coyote densities in localized areas may be temporarily reduced through WS's damage management, reproduction and immigration of coyotes from surrounding areas

	Analysis Area	Wyoming
Est. Pop.	11,625	58748
WS Kill	2544	5565
Other Take	2042	10865
Total Take	4586	16430
WS Kill -% of Population	21.9	9.5
Other Take-% of Population	17.6	18.5
Total Take - % of Population	39.5	28

repopulates these areas (Windberg and Knowlton 1988). Henke (1992) noted that in his study area, coyote density returned to pre-removal levels within 3 months following removal efforts.
A population model developed by Connolly and Longhurst (1975), and revisited by Connolly (1995), suggested that coyotes can withstand an annual mortality of 70% and still maintain a viable population. Evaluating the data using standards established in USDA (1994), removal of 40% of the coyote population in the analysis area would result in cumulative impacts of a *low magnitude*. This conclusion is consistent with the GAO (1990) assessment regarding WS's impacts on coyote populations in the western U.S.

Red Fox Population Information

Red fox predation in the analysis area is confined to lambs and poultry. Verified and reported damage was about $465, $364 and $564 in 1994, 1995 and 1996, respectively. Additionally, red fox predation on nesting waterfowl and nesting and winter concentrations of pheasants are sometimes of concern to the WGFD.

Red fox are the most common and well-known species in the genus *Vulpes* and are the most widely distributed non-specific predator 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, Richards 1974, 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 during the last 25 years. Investigations have revealed that red foxes are extremely adaptive with much diversity in their behavior and habitats. Voigt and Earle (1983), Sargeant et al.(1987), and Gese et al. (1996) showed that red foxes avoided coyotes but coexisted in the same area and habitats.

The density of red fox populations is difficult to determine because of the species' secretive and elusive nature. However, the red fox has a high reproductive rate and dispersal capacity similar to coyotes, and is capable of withstanding 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 1 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 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 more than 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 1 fox den/3 mi^2.

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 states that habitat destruction that reduces prey numbers, water and cover will impact fox populations to a greater extent than a short-term over harvest.

Fox populations in eastern Wyoming appear to be stable (WGFD 1996). Concerns however, have been expressed by sportsmen and legislators that high red fox populations may be having a detrimental impact on game bird populations. While red fox populations are usually higher in cultivated areas and river valleys, WS personnel routinely observe red fox in every habitat in eastern Wyoming, from high mountains to open desert. For purposes of this analysis, we will conservatively estimate red fox densities at 1.0/mi^2 on 50% of the analysis area. This would equate to a total population in the analysis area of about 9,687 red fox.

Table 4-4. Eastern Analysis Area Red Fox Harvest Data
Allowable Harvest = 70%

1994	Analysis area	Wyoming
Est. Pop.	9,687	49,000
WS take	388	1,102
Other take	1,727	7,730
Total take	2,115	8,832
WS Kill % of Pop.	4.0%	2.2%
Other take % of Pop.	21.8 %	14.8%
Total take % of Pop.	25.8%	18.0%
1995		
WS take	197	772
Other take	1,012	4,526
Total take	1,209	5,298
WS Kill % of Pop.	2.0%	1.6%
Other take % of Pop.	10.4%	9.2%
Total take % of Pop.	12.4%	10.8%

Red Fox Population Impact Analysis

WS removed 388 and 197 red fox in the analysis area in 1994 and 1995, respectively, (Table 4-4). The WGFD reported an estimated 3,865 and 2,263 red foxes harvested by fur trappers Statewide in 1994 and 1995, respectively, (WGFD 1995). Survey data collected by WGFD suggest that about 22% of red fox were taken in the analysis area. For purposes of this analysis we will assume that number equals the number taken by fur trappers. Private aerial hunters took about 27 and 16 red fox in 1994 and 1995, respectively. The total estimated private take of red fox in the analysis area was about 1,727 and 1,012 animals in 1994 and 1995, respectively. The total estimated cumulative annual take would therefore be about 2,115 and 1,209 animals in 1994 and 1995, respectively, or 25.8% and 12.4% of the population.

The allowable harvest level cited for red fox (USDA 1994, Chap. 4, p.12) is 70% of the total population. The data for 1994 and 1995 suggest that the WS kill in the analysis area was about 4.0% and 2.0% of the estimated population. Because the total estimated harvest level of 25.8% and 12.4 is well below 70%, the magnitude of impact is determined to be low.

Black Bear Population Information

The 1994 through 1996 WS verified black bear predation in the analysis area included 13 lambs valued at $680 (MIS 1994, MIS 1995a, MIS 1996a).

Black bears have a wide but patchy distribution in the United States. They can be found throughout the Rocky and West Coast Mountain ranges and can occur throughout Wyoming, but are more common in forests, swamps, dense thickets and mountainous areas in the northwestern part of the State. Bears can also be found in croplands, forest plantations and orchards where they may cause damage. Bears also present problems concerning livestock predation, property damage, and threats to public safety and nuisance situations. Wyoming Statutes currently provide monetary compensation for damage to livestock caused by black bears (WSS 23-1-901) and allow a property owner, employees of the owner, or lessee to immediately kill any bear doing damage to private property (WSS 23-3-115) (WGFD 1994).

The age structure of bear populations is one indicator of population health. Because bears are relatively long-lived animals, bears in the older age classes should be found in a healthy population. If a population is over exploited, the older aged bears would not be present or in low proportions. Black bears can live up to 25 years (USDA 1994) and have densities between 0.3 and 3.4/mi^2, depending on habitat.

Female black bears generally reach reproductive maturity at about 3½ years of age (Kohn 1982). In Montana, female black bears generally reach reproductive maturity at about 4½ years of age but may not breed successfully until 6 or 7 years of age and produce a litter in three year intervals (MFWP 1994). In Idaho, female black bears generally reach reproductive maturity at 4 years of age (IDFG 1992). Following a 7-8 month gestation period (about 220 days), black bear can produce from one to five cubs, with two young per litter being most common (Rogers 1976, Alt 1981, Kolenosky and Strathearn 1987); in Idaho they produce an average of 1.5-1.8 cubs per female. Lightly hunted areas in Idaho have a high ratio of adults to subadults (70:30), a high percentage of adult males (35%), with 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 1992). Researchers have estimated total adult mortality of black bears between 15% and 27% annually. Fraser et al. (1982) determined natural mortality in adult bears in his study area to be about 10 to 20%. Their (1990) recorded an annual mortality rate of 25%, and Jonkel and I. McT. Cowan (1971) estimated natural mortality rates for adults at 14%. Juvenile black bear annual mortality ranges from 20% to 70%, with orphaned cubs having the highest mortality (Kolenosky and Strathearn 1987); natural mortality of cubs is difficult to document but has been found to vary from 12% to 48% annually (MFWP 1994). Mortality in subadult black bears in Montana has been reported to be 36.8% (Their 1990).

Black bear movements and densities reflect the scattered nature of important food sources and can be as high as 3.4 bear/mi^2, depending on the quality of habitat. The highest quality black bear foods are typically products of lush vegetative habitats, often productive riparian lands (Schoen 1990), a factor contributing to conflicts with humans and other land uses (MFWP 1994). Black bear densities of at least 1.0/mi^2 have been documented in the states of Washington, California and Idaho (ODFW 1993). The current Wyoming statewide population is not known.

Black Bear Population Impact Analysis

WS did not take any black bears in the analysis area from 1994 through 1996. In 1994 and 1995, sport harvest and other take of black bear was 34 and 28, respectively (WGFD, Harvest Data, 1996b).

In specific areas with chronic or significant livestock losses from black bears and mountain lions, damage management of offending individual animals may be necessary. These actions would be undertaken by WS only after coordination with the WGFD. The WGFD Large Predator Coordinator in Lander, Wyoming would be provided information on the harvested animal(s) and the circumstances of each damage management action so this harvest could be included in the WGFD's harvest records for this species.

All bear damage management undertaken by WS in Wyoming is in full cooperation with, and at the request and direction of the WGFD. As the entity with management authority over black bear in Wyoming, the WGFD is in the best position to determine whether damage management would have significant adverse impacts on the overall population. The WGFD has determined that the WS take of black bear is not adversely impacting the viability of black bear in Wyoming (Harju 1996).

The allowable harvest (kill) level for black bear described in USDA (1994, Table 4-2) is 20% of the population. WGFD (1994) uses sex ratios and age structure to evaluate harvest impacts to black bear populations. Current black bear harvest, whether by hunting, WGFD, WS, livestock producers or other causes, is not causing a decline in bear populations, and black bear populations in Wyoming appear to be stable (D. Moody, WGFD pers. comm.1996).

WS and the WGFD damage management efforts are considered quite important by WGFD in resolving black bear damage, protecting public safety and meeting WGFD black bear damage goals. The stable population trend appears unchanged and the 1994 through 1996 WS kill and *"Other Take"* would be a *low magnitude* of impact.

Mountain Lion Population Information

In FY 95, more than 77% of all mountain lion predation reported to and verified by WS in the analysis area was on sheep. In FY 96, 100% of mountain lion predation was on calves. The total reported loss to mountain lions in the analysis area was valued at $1,550 and $300 in FY 95 and FY 96, respectively (MIS 1995a, MIS 1996a).

Mountain lions have an extensive distribution across North America, including Wyoming. 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.

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 related to prey availability and the social tolerance for other mountain lions. 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 mountain lion populations, but because mountain lions are territorial animals, the rate of population increase tends to decrease as density increases. As mountain lion population density increases, (1) mortality rates from intra specific fighting and cannibalism also increase, and/or (2)individuals disperse into unoccupied or less densely occupied habitats. 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.

A change in the mountain lion age structure and hunter effort expended to harvest are measures of mountain lion density and the health of the population (WGFD 1996b). 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). In Wyoming, mountain lion harvest rates have been increasing with 85 lions taken in 1992, 106 in 1993 and 124 in 1994. Analysis of harvest data suggests that mountain lion populations are increasing throughout Wyoming.

Mountain Lion Population Impact Analysis

Mountain lion populations can sustain relatively moderate to heavy losses of adults and still maintain viable populations. Robinette et al. (1977) reported an 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 on their study area had the recruitment (reproduction and immigration) capability to rapidly replace annual losses. The allowable annual harvest level for mountain lion cited in the USDA (1994) is 30% of the population.

Mountain lions are managed as trophy game animals in Wyoming by the WGFD with the 1993-1995 average annual sport harvest in Wyoming about 105 animals; any WS mountain lion would be closely coordinated with the WGFD. WS did not take any mountain lions, target or non-target, during FY 1993 through 1996 (WS program records 1993, MIS 1994, MIS 1995a, MIS 1996a). This data indicates that WS is not having any impact on the mountain lion population in the analysis area.

Bobcat Population Information

Bobcat predation on livestock in the analysis area is primarily on sheep. During the period from FY 1994 through FY 1996, WS verified bobcat predation on one sheep valued at $70.

Bobcats reach reproductive maturity at 9 to 12 months of age and may have from 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 has been as high as 47% (Rolley 1985). Analysis of Wyoming bobcat harvest data suggests that populations are healthy and productive, and that current harvest levels are not detrimental to bobcat populations (WGFD 1995). 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.

Bobcat Population Impact Analysis

The WGFD reported an estimated Statewide bobcat harvest of 687 in the 1993-94 season and 489 in 1994-95. Of this total, about 22% (153 and 108 bobcats) were probably taken within the analysis area (WGFD 1995). WS killed twelve bobcats in the analysis area in 1994 and 1995 combined, which represents less than 4.4% of the total combined take of 273 animals over the two years. The allowable harvest for bobcats cited in USDA (1994) is 20% of the total population. The WGFD manages bobcats as furbearers and monitors the harvest to maintain healthy and viable populations. The WGFD believes it is unlikely that either sport harvest or harvest by WS personnel to reduce depredations will significantly impact local or statewide population viability (Harju 1996). Therefore, the WS take is a *low magnitude* of impact.

Raccoon Population Information

Raccoon damage in the analysis area is confined primarily to poultry and food stocks. In 1995 and 1996, all WS verified raccoon depredation involved vegetable foods, livestock feed and domestic geese.

Raccoons are one of the most omnivorous of 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).

Sanderson (1987) stated that absolute population densities of raccoons are difficult if not impossible to determine because of the difficulty in knowing what percentage of the population has been counted or estimated, and the additional difficulty of knowing how big an area the raccoons are using. Twichell and Dill (1949) reported one of the highest densities, with 100 raccoons removed from winter tree dens on 101 acres of a waterfowl refuge in Missouri. Other studies have found raccoon densities that ranged from 9.3/mi^2 to 80/mi^2 (Yeager and Rennels 1943, Urban 1970, Sonenshine and Winslow 1972, Hoffman and Gottschang 1977, Rivest and Bergerson 1981). Specific estimates of raccoon densities are not available for eastern Wyoming, but the WGFD believes that current populations are stable to increasing (WGFD 1995).

Raccoon Population Impact Analysis

In the 1994-95 season, raccoon harvests for Wyoming totaled about 1,202 animals. About 517 (43%) of these were harvested within the analysis area (WGFD 1995). WS took a total of 3 raccoons in the analysis area in FY 95, of which one was killed and two were released. A total of 30 raccoons were taken in FY 96, 25 of which were taken in response to the rabies epizootic in Campbell County.

Because raccoon populations are judged to be stable or increasing in spite of the present level of overall harvest, the qualitative determination of the cumulative impacts on raccoon populations would be of *low magnitude*.

Badger Population Information

Badger damage within the analysis area can range from damage to pasture and agricultural lands to losses of equipment and livestock. However, WS verified no damage specifically attributable to badgers within the analysis area in 1995 or 1996. WS occasionally takes badgers as a target species, but they are more often captured as a non-target species when attempting to capture coyotes in leg-hold traps. The badger is classified as a furbearer within Wyoming and managed by the WGFD but there is no closed season.

Badgers are members of the *Mustelidae* family. The badger is a large broad bodied animal with strong legs and long claws adapted for digging. Male badgers average 19 lb. and females average 14 lb. (Hegdal and Harbour 1991). Badgers are inhabitants of grassland communities, but can also be found inhabiting forest edges. Badgers are opportunistic feeders preying on a wide variety of birds, mammals, eggs, reptiles, amphibians, invertebrates, and even plant materials (Long and Killingley 1983).

Little is known about badger densities other than a few intensely studied populations. Lindzey (1971) estimated that Curlew Valley on the Utah-Idaho border supported 1 badger/mi^2. Messick and Hornocker (1981) believed that the Snake River Birds of Prey Natural Area and adjacent lands in southwestern Idaho supported badger densities of up to 13/mi^2.

Badger Population Impact Analysis

Badger populations can safely sustain a harvest rate of 30-40% annually (Boddicker 1980). The WGFD reported an estimated 383 badgers taken by private trappers statewide during the 1994/95 season. An estimated 87 badgers, or 22% of the Statewide harvest was estimated to have occurred within the analysis area (WGFD 1995). WS removed a total of 4 badgers in the analysis area during FY 95 and 5 in FY 96, all of which were non-target animals. The combined private trapping harvest and WS harvest of badgers within the analysis area was about 91 badgers in 1995. The WS take of 4 badgers, therefore, represents about 4% of the total. The WGFD believes that badger populations in Wyoming are stable (WGFD 1995), therefore cumulative impacts are of the *low magnitude*.

Striped Skunk Population Information

Skunks primarily cause odor problems around homes, transmit diseases such as rabies and distemper to humans and domestic animals, and prey on poultry.

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. However, no well-defined land type can be classified as skunk habitat (Rosatte 1987). Striped skunks can live in a variety of environments, including agricultural lands and in urban areas.

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 denning, feeding activities, and dispersal (Rosatte 1987). Home ranges reported in the literature for striped skunks in rural areas averaged between 0.85 to 1.9/mi^2 (Houseknecht 1971, Storm 1972, Bjorge et al. 1981, Rosatte and Gunson 1984). Skunk densities reported in the literature range from 0.85 to 67/mi^2 (Jones 1939, Ferris and Andrews 1967, Verts 1967, Lynch 1972, Bjorge et al. 1981). 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 Wyoming are not available.

Striped Skunk Population Impact Analysis

Skunk populations can reportedly sustain a 60% annual harvest level indefinitely (Boddicker 1980). Fur harvest data indicates that during the 1994-95 and 1995-96 seasons, a combined total of 1,967 skunks were taken by trappers statewide (WGFD 1995). During 1995, WS personnel killed three skunks in the analysis area, all of which were non-target animals. In response to an outbreak of skunk rabies, WS took 325 skunks in Campbell County during FY 96 for protection of human health and safety. An additional 4 skunks were taken as non-targets. It is unknown what percentage of the statewide fur harvest occurred in the analysis area. Because the WS harvest is very low when compared to the *other harvest*, WS cumulative impacts are of the *low magnitude*.

Raven Populations and Impact Analysis

The common raven, American crow, and black billed magpie are the most well known species in the family *Corvidae*. The common raven is widely distributed throughout the Holarctic Regions of the world including Europe, Asia, 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). 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, birds, small mammals, amphibians, reptiles, fish and insects (Nelson 1934). Larsen and Dietrich (1970) reported that ravens are sometimes responsible for lamb mortality on spring lambing ranges.

Knight and Call (1981) summarized a number of studies on raven territories and home ranges in the western United States. Nesting territories ranged in size from 3.62mi^2 to 15.7mi^2 in Wyoming and Oregon and home ranges varied from 2.53mi^2 to 3-6mi^2 in Utah and Oregon. Linz et al. (1990) found nest densities of 1.7/mi^2 in their Camp Pendleton, California study. Raven home ranges overlap considerably and it is believed that a reasonable density estimate of breeding birds in the analysis area is one raven/3 mi^2, resulting in a population estimate of about 6,458 birds. Information on actual raven densities in the analysis area is not available, but population trend information is available from two different sources. Breeding Bird Survey data maintained by the USFWS, and National Audubon Society Christmas Bird Count data both suggest that raven populations in Wyoming are increasing. Christmas Bird Count data (1966-1995) shows a trend of raven numbers increasing at about 4.9% annually and abundant in Wyoming. If current raven densities in the analysis area were conservatively estimated at about one raven/15mi^2, there would be an estimated minimum population of about 1,291 ravens in the analysis area. If raven populations are increasing at an annual rate of 4.9%, then about 63 ravens could presumably be removed from the population annually without reducing the current population level.

WS has not removed any ravens during predator damage management operations in the analysis area during the 1993-1996 period.

4.3.1.2 Alternative 2 - No Federal Predator Damage Management in the Analysis Area, and Alternative 6 - Technical Assistance Only.

Because neither of these alternatives would provide for any operational WS activities, there would be no WS impacts on the viability of any wildlife populations. There would likely be increased impacts on some wildlife populations, particularly coyotes from other sources addressing damage problems. This could take the form of increased private aerial hunting or other control efforts by individual livestock producers, and/or the establishment of organized State, county, or private predator damage control programs. Because WS's current program results in a low magnitude of impact on the viability of wildlife populations, it is believed that other compensatory forms of wildlife damage management could result in different impacts, particularly to non-target species.

4.3.1.3 Alternative 3 - Fully Integrated Wildlife Damage Management (IWDM) for Multiple Resources and Land Classes: (Proposed Action).

The M-44 and LPC are selective for the target species and individual, respectively, and would not substantially increase the number of coyotes removed because of depredation problems. Predator damage management work plans on BLM and National Forest System lands would restrict the areas where the M-44 would be used and when they would be used; LPCs would not be used on public lands. The total take of predators could increase slightly but the non-target species would decrease slightly. These changes would not be enough to appreciably change the impacts as assessed under Alternative 1.

4.3.1.4 Alternative 4 - Non-lethal Control Required Prior to Lethal Control.

As noted throughout the document, Alternative 4 is similar to the existing program because many livestock producers utilize non-lethal methodology on a voluntary basis. The viability of wildlife populations under Alternative 4 would not be substantially different from Alternative 1.

4.3.1.5 Alternative 5 - Corrective Control Only.

The total number of predators taken by WS could decrease under this alternative, and WS impacts to predator populations could be reduced to some degree. But because WS's current take of predators results in a low magnitude of impact, the impact to populations resulting from implementation of a "*corrective control only*" alternative would not differ significantly from the impacts of the current program.

4.3.1.7 Alternative 7 - Predator Damage Management with Only Mechanical Methods (No Use of Chemicals).

Alternative 7 would not allow for use of M-44s, the gas cartridge, the LPC, DRC-1339, or immobilizing and euthanizing chemicals in predator damage management operations within the analysis area. While these methods are at times important in resolving specific damage problems, the overall numbers of animals taken by these methods would be low in comparison to the take of animals by mechanical methods such as aerial hunting. Use of other methods would likely increase to compensate for the loss of chemical damage management methods. While this would result in decreased cost-effectiveness and reduced effectiveness in resolving some predation problems, it would not likely result in any increased impacts to predator populations that differed significantly from the impacts of the current program.

4.3.2 Effectiveness and selectivity of damage management methods.

Chapter 3 includes discussions about the relative effectiveness and selectivity of various methods used by WS in Wyoming and that discussion will not be repeated here. Under the current program, all methods are used as selectively and effectively as practically possible, in conformance with the Decision Model (Slate et al. 1992) and ADC Program Directives. The selectivity of each method is based, in part, on the application of the method, skill of WS personnel, and the direction provided by ADC Directives and policies. The humaneness of each method is based on the perception of pain or anxiety caused by the method. How each method is perceived often differs, depending on the person's familiarity and perception of the issue as discussed in Chapter 2.

The selectivity and effectiveness of each alternative are based on the methods employed under that alternative. WS personnel are trained in the use of each method and certified by the WDA as pesticide applicators for each pesticide and certified by WS to use immobilizing or euthanizing chemicals. Effectiveness of the various methods may vary depending on local circumstances at the time of application. Some methods may be more or less effective or applicable depending on weather conditions, time of year, biological and economic considerations, legal and administrative restrictions, or other factors. Because these various factors may at times preclude use of certain methods, it is important to maintain the

widest possible selection of damage management tools/methods to most effectively resolve predator damage problems.

4.3.2.1 Alternative 1 - Current Analysis Area WS Program: (No Action).

Several of the methods employed under the current program are typically 100% selective for target species. These methods include aerial hunting, shooting from the ground, and denning. Cage trapping may capture some non-target animals, but these animals can typically be released unharmed. DRC-1339, for reducing raven damage, is very selective for the target species because prebaiting and baiting procedures ensure that non-target species are unlikely to be exposed to the baits. If by some remote chance a non-target mammal was exposed to DRC-1339 meat or egg baits, risks are very low because of the chemical's low toxicity to mammals (DeCino et al. 1966, Schafer 1981). Immobilizing and euthanizing chemicals are 100% selective, not only for the target species but for the target individual.

While the methods discussed above are nearly 100% selective in killing only the target species, other methods such as leg-hold traps and snares are somewhat less selective. Table 4-5 shows the FY 94-96 cumulative number of target and non-target animals captured and killed in the analysis area by these methods, and their selectivity expressed as an average percent of non-target versus target animals taken by each method.

WS's use of leg-hold traps would be more humane, and the number of non-targets killed would be lower, if traps could be monitored at least daily. Unfortunately, the amount of area that each WS Specialist is responsible for and the number of requests for assistance is such that WS personnel are typically not able to monitor traps every day. WS's trap-checking interval is more often closer to the 72-hour limit imposed by State statute. WS uses leg-hold traps with offset or padded jaws to reduce injuries, and WS's use of pan-tension devices make leg-hold traps much more selective. Pan-tension devices increase the weight required to trip the trap, and are successful in significantly reducing the incidence of capturing smaller non-target species (Turkowski et al. 1984, Phillips and Gruver 1996). Pan-tension devices are always used by WS unless their use would preclude capture of the intended target species. WS personnel often try to reduce the need for setting traps or snares by first trying to remove problem animals by shooting. If shooting is unsuccessful or not feasible, then equipment must be set to try to resolve the problem. Non-target animals captured in traps or snares are released whenever it is judged that they would survive.

As used by WS in the analysis area, snares are slightly more selective for target species than leg-hold traps. Spring-activated leg snares set for bears or mountain lions are typically 100% selective for the target species, but neck snares are less selective. The selectivity of snares is largely a function of how and where they are set. Break-away snares locks are used to provide for the release of larger animals that would be accidentally caught.

Table 4-5. Selectivity of Leghold Traps, Snares and M-44s by WS Personnel in the Analysis Area (FY 1994-96)

	Traps[1]	Snares[1,2]	M-44s [3]
Targets			
Badger	4	1	0
Beaver	0	1	0
Bobcat	2	8	0
Coyote	193	197	736
Red Fox	116	70	342
Raccoon	6	12	0
Skunk	11	6	2
Porcupine	4	7	0
3-Year Total	336	301	1,080
Nontargets			
Badger	6	4	0
Bobcat	9	2	0
Rabbit	7	0	0
Red Fox	5	11	1
Porcupine	6	9	0
Raccoon	2	6	2
Skunk	8	1	0
3-Year Total	43	33	3
% Selectivity	88.7%	90 %	99.7 %

[1] These figures refer only to the lethal take of animals caught in leghold traps and snares.
2 These figures refer primarily to animals caught in neck snares. No animals were caught in foot snares.

Use of livestock guarding dogs by sheep producers has been effective in preventing some predation losses (Green and Woodruff 1987), and use of guard dogs is generally perceived as a selective form of non-lethal control. But use of guard dogs may also involve deaths of target and non-target animals. Timm and Schmidt (1989) documented that guard dogs in their study regularly killed deer fawns, and anecdotal evidence from WS field personnel and livestock producers suggest that guard dogs sometimes kill coyote and red fox pups as well as deer fawns and elk calves. Llamas have also been advocated as effective livestock guarding animals (Franklin and Powell 1994), but some degree of non-target hazard may likewise exist from the use of llamas for this purpose. Llamas are sometimes carriers of paratuberculosis (Johne's disease) which may be transmissible to native ungulates or domestic livestock (Wildlife Management Institute 1995). This disease involves a chronic wasting of the intestinal tract and associated lymphoid tissues, and there is no known cure.

Animals that are captured are euthanized, or in the case of a non-target animal, released if judged capable of surviving. Target to non-target capture rates for less skilled trappers, or trappers that do not use pan-tension devices contribute to the perception that leg-hold traps are not selective. However, because of their skill, mitigation measures, and WS trapping policy restrictions, traps are more selective as used by WS personnel. In FY 94 through FY 96 combined, 713 animals were captured and killed of which only 76 were non-target. Non-target animals killed, therefore, represent less than 11% of the total animals taken by WS.

Use of dogs can be highly selective, not only for the offending species but for offending individuals. Dogs are moderately expensive to use due to the expenses required for feeding and maintaining the dogs, but they can be utilized in several ways which increases predator damage management effectiveness.

Denning is the practice of finding the den of the offending species and asphyxiating the young with a gas cartridge that produces carbon monoxide when ignited. Denning is very selective and effective for reducing predator losses because positive identification of the species is possible (Till and Knowlton 1983, Till 1992).

The current program uses the preceding methods to manage predator damage in the analysis area. Non-capture methods (aerial hunting, call and shoot, shooting, denning, M-44s and dogs) accounted for 7,512 target animals taken in the analysis area, or 90.2% of the target animals taken in FY 94 through FY 96 (MIS 1994, 1995a, 1996a). Capture methods (leg-hold traps, cage traps and neck snares) accounted for 812 target animal captures, or 9.8% of the target animal captures taken in FY94 through FY 96 (MIS 1994, 1995a, 1996a).

Aerial hunting, call and shoot, shooting, dogs, and denning by skilled WS personnel are extremely selective methods: no non-target animals were taken by these methods in FY94 through FY 96 while 83% of the target animals were taken by these four methods combined.

4.3.2.2 Alternative 2 - No Federal Predator Damage Management in the Analysis Area, and Alternative 6 - Technical Assistance Only.

Under both Alternative 2 and Alternative 6, no Federal operational predator damage management would exist, therefore no methods would be employed by WS personnel and selectivity and effectiveness of methods used by WS would not be an issue. Livestock producers, or State and local agencies would likely conduct predator damage management and possibly the use of methods under these programs would be less selective due to lack of training, experience, adequate time to devote to damage problems, and less regulated. Illegal use of pesticides could occur, along with indiscriminant trapping. State law currently provides that red fox and coyotes may be taken by livestock producers without a license or season restrictions. Further, livestock producers or their employees may take a mountain lion or bear which has killed livestock. Without the Federal WS program, producer implemented non-lethal methods would likely decrease, as producers focus their attention on lethal methods.

4.3.2.3 Alternative 3 - Fully Integrated Wildlife Damage Management (IWDM) for Multiple Resources and Land Classes: (Proposed Action).

Alternative 3 would be considered more selective and effective than Alternative 1, owing to availability of M-44 and LPC use, and a decrease in the reliance on leg-hold traps and snares. M-44 devices could not be used for the protection of wildlife other than T&E species, and LPC's would only be used to protect livestock on private lands. Methods and restrictions for reducing black bear and mountain lion damage would not change. Producer implemented non-lethal control methods would remain the same. The shift in methods would result in an increase in selectivity and effectiveness over Alternative 1.

4.3.2.4 Alternative 4 - Non-lethal Control Required Prior to Lethal Control.

As noted throughout the document, Alternative 4 is similar to the existing program because many livestock producers utilize non-lethal methodology on a voluntary basis. Selectivity would not be substantially different from Alternative 1. Livestock losses under Alternative 4 would be likely to increase somewhat because WS response would be postponed or denied to those livestock producers who, for whatever reason are not or have not used non-lethal methods.

4.3.2.5 Alternative 5 - Corrective Control Only.

Under Alternative 5, WS would still be able to respond with all the methods included under Alternative 1 or 3, but would not be authorized to employ any of these methods under a lethal preventive damage management strategy. Selectivity of methods would be similar to Alternative 1 or 3, but WS would be less effective at reducing livestock losses. By restricting corrective control to the immediate vicinity of predation losses, WS would be unable to effectively resolve some depredation problems. Till (1992), for instance, found that depredating coyotes traveled an average of 2 miles and as far as 6 miles from their den site to the sheep flocks where they were killing lambs. Shivik et al. (1996), by using radio-telemetry, documented that coyotes would travel up to seven kilometers, and through other coyote territories to kill lambs.

WS would likely be less effective at reducing coyote predation on spring and summer livestock grazing areas. Decreased effectiveness is tied to the logistics of getting to these areas and having to use less effective coyote damage management methods during certain months. Till and Knowlton (1983) noted that the coyotes most likely to kill sheep are the ones raising pups. Gantz (1990) suggested that late winter aerial hunting of coyotes on summer sheep grazing allotments removes coyotes that otherwise likely would have produced pups. By conducting preventive damage management in late winter or early spring, the likelihood of transient coyotes reoccupying and establishing their own territories in time to produce pups is reduced. Gantz (1990) concluded that late winter aerial hunting of coyotes on summer sheep range was an effective method to reduce coyote predation. Wagner (1997) determined that aerial hunting 3 to 6 months before sheep are grazed on an area was cost effective when compared to areas without aerial hunting. Wagner (1997) concluded that preventive aerial hunting reduced the number of traps, snares, and M-44s needed in the field to reduce predation and therefore a potentially significant reduction in risks to non-target species.

Alternative 5 would be considered less selective than Alternative 1 or 3, because of the loss of preventive aerial hunting on summer sheep grazing allotments and subsequent reliance on methods that may be less species-specific. The cost of predator damage management would increase under Alternative 5, due to intensive predator damage management that would be required without preventive damage management. Livestock loss to predators would be expected to increase under Alternative 5 as compared to Alternatives 1 or 3 because damage management would only occur after a livestock loss was verified as predation.

4.3.2.7 Alternative 7 - Predator Damage Management with Only Mechanical Methods: (No Use of Chemicals).

This alternative would preclude use of the M-44, the gas cartridge, the LPC, DRC 1339, and immobilizing and euthanizing chemicals, all of which are very selective. Use of traps and snares would increase, so overall selectivity and effectiveness would probably be slightly reduced. The Decision Model (Slate et al. 1992) would still be used to determine the most appropriate method(s) to be used, but without the use of chemicals, the available options and overall effectiveness would be reduced. Producer implemented non-lethal methods would remain unchanged.

4.3.3 Risks Posed by Damage Management Methods to the Public and Domestic Pets.

Predator damage management conducted by WS in the analysis area is directed by ADC Directives, cooperative agreements, MOUs, and Federal and State laws. Effects on public health and safety include potential benefits caused by WS fostering a safer environment and potential negative effects that might result from the exposure of the public to damage management methods. WS uses chemical and non-chemical methods that are appropriate to reduce or minimize a variety of damage problems and WS personnel are aware of the potential risks to humans and pets. The use of toxicants by WS in all instances is regulated by the EPA through the FIFRA, by State law, and by ADC Directives. Along with effectiveness, cost, and social acceptability, risk is an important criterion for selection of an appropriate damage management strategy. Determination of potential risks to non-target animals, the public, and WS personnel is thus an important prerequisite for successful application of the IWDM approach. Based on a thorough Risk Assessment, (USDA 1994, Appendix P), APHIS concluded that, when WS program methods are used according to ADC Directives, policies and laws, and when chemicals are used according to label directions, they are selective for target individuals or populations, and such use has negligible impacts on the environment.

4.3.3.1 Alternative 1 - Current Analysis Area WS Program: (No Action).

The current Wyoming WS predator damage management program is based on an IWDM approach to protect livestock and public health and safety on public and private lands and described in Chapter 3 of this EA. Based on the risk assessment from USDA, Appendix P (1994) the environmental and public health and safety risks associated with WS's damage management are low. The four chemical methods used in predator damage management (sodium cyanide in the M-44, sodium nitrate in the gas cartridge, Compound 1080 in the LPC and DRC 1339) posed possible risks, but noted that the risks associated with these methods were mitigated through specific direction provided by WS program policies. Risks identified in the evaluation process for these four chemicals were primarily environmental risks addressed by the EPA rather than safety or health risks to the public. The greatest risks to public health and safety from WS's use of chemical methods are incurred by WS personnel who use these methods. Likewise, the greatest risk to public health and safety from WS's use of mechanical damage management methods are incurred by WS personnel who use methods such as aerial hunting. From FY 93 through FY 96 there were no reported injuries to WS personnel or members of the public related to WS's use of any chemical or mechanical damage management methods. Mitigation measures that address safety concerns about WS's use of management methods are listed at the end of Chapter 3.

Of the non-chemical wildlife damage management methods used by WS, leg-hold traps and neck snares pose the greatest risk to non-target species. However, domestic pets that may be captured in these devices and accompanied by humans can be released unharmed. WS limits the use of leg-hold traps and snares on public lands during bird hunting seasons, and warning signs are posted in areas where devices are set on public or private lands.

Of the chemical methods currently used by WS, M-44s are the only method that may present some degree of risk to the public or free roaming dogs. As discussed in Chapter 3, this risk is mitigated by restricting M-44 use, by not placing M-44s on public lands during the regular bird hunting seasons or in any other place where exposure to the public or pets is probable, and by placing warning signs in the general area and within 25 feet of each M-44 device.

4.3.3.2 Alternative 2 - No Federal Predator Damage Management in the Analysis Area, and Alternative 6 - Technical Assistance Program.

Both of these alternatives would result in no Federal operational predator damage management program in the analysis area, therefore the use of methods would be at the discretion of individuals or agencies that conduct the activity. The low risks associated with Federal use of damage management methods would be non-existent under this Alternative. WS would make recommendations (Alternative 6), but implementing the recommendation would be by some other entity. However, increased use of the same methods by less skilled trappers or livestock producers, and greatly reduced restrictions on how predator damage management is conducted could result in an increased risk to the public. No program would be available to protect aviation safety, and WGFD or Wyoming Department of Health would not have access to WS personnel in the event of wildlife threats to public health and safety, such as rabies. This Alternative would likely result in increased risks to public health and safety over those identified in Alternative 1.

4.3.3.3 Alternative 3 - Fully Integrated Wildlife Damage Management (IWDM) for Multiple Resources and Land Classes: (Proposed Action).

Analysis is the same as Alternative 1, except for the inclusion of the use of M-44s on BLM and National Forest System lands and LPC use on private lands. The impacts to public health and safety would be similar to Alternative 1 because of: 1) the EPA restrictions and mitigations for M-44 and LPC use, 2) to decreased risks because of enhanced cooperation, and 3) coordination and planning between WS and other agencies that would be included in the planning process. The 26 EPA use restrictions preclude use of the M-44 in areas where it may pose a danger to T&E species. Dogs are susceptible to M-44s and discretion must be used when setting M-44s in areas that may be frequented by dogs. However, no M-44 devices would be used on any public lands during the regular upland bird hunting seasons and no M-44s would be allowed within ¼ mile of any residence, community, or developed recreation site, unless requested by the owner of a privately-owned property or an official from the appropriate land management agency. Warning signs would be posted on main roads and/or trails leading into any areas where M-44s were being used and individual warning signs would be placed within 25 feet of each M-44 device. These signs would be removed at the end of the damage management period. M-44s (sodium cyanide) present no secondary poisoning risks to other animals that may scavenge on an animal killed by an M-44 (USDA 1994, Appendix P: 269-271).

The LPC was designed to specifically target coyotes that attack the throat of sheep or goats. Predators, including dogs, that have attacked collared sheep by the throat have succumbed to the toxicant. Domestic dogs could also be susceptible to poisoning if they scavenged on the 1080-contaminated throat of a collared lamb or sheep that had been killed by another predator. The likelihood of this occurrence would be low because LPCs would only be used within fenced pastures on private lands, and the carcasses of any dead collared livestock would be removed in conjunction with the regular monitoring requirements for use of the collar. Risk would also be reduced because of the tendency for scavengers to feed preferentially in the area of the thoracic cavity and the hind portion of the carcass, while 1080 contamination would be limited primarily to the collared animal's neck (see 2.3.20 for additional information on the secondary risks of 1080). The risk assessment in USDA (1994 Appendix P: 274) concluded that use of the LPC would pose little likelihood of a dog being poisoned.

4.3.3.4 Alternative 4 - Non-lethal Control Required Prior to Lethal Control.

As noted throughout the document, Alternative 4 is similar to the existing program because many livestock producers utilize non-lethal methodology on a voluntary basis. The impacts of Alternative 4 on public health and safety are similar to those identified for Alternative 1.

4.3.3.5 Alternative 5 - Corrective Control Only.

Preventive damage management is normally carried out at the time of year when opportunity for public conflict is lowest. If no preventive damage management resulted in an increase in management actions at

the year of year when the public is present this could result in an increased risk to the public and pets (Wagner 1997).

4.3.3.7 Alternative 7 - Predator Damage Management with Only Mechanical Methods: (No Use of Chemicals).

The analysis would be the same as Alternative 1 for the mechanical methods. Overall level of risk to domestic pets and public safety would be reduced slightly because there would be no risk associated with M-44 or LPC use.

4.3.4 Concerns about WS's Impact on T&E Species.

4.3.4.1 Alternative 1 - Current Analysis Area WS Program: (No Action).

WS in Wyoming has conducted an informal ESA consultation with the USFWS regarding the potential impacts of the current program and the proposed action. The USFWS has concurred with WS's evaluation that neither the current program nor the proposed action is likely to adversely affect any T&E species that may occur within the analysis area. Mitigation measures to address concerns about impacts to T&E species are listed in the mitigation measures at the end of Chapter 3.

4.3.4.2 Alternative 2 - No Federal Predator Damage Management in the Analysis Area, and Alternative 6 - Technical Assistance Program.

There would be no operational WS activities under either of these alternatives, and hence no risks to T&E species from WS. Some type of damage management would most likely be implemented by livestock producers or private entities and these activities could pose greater risks to T&E species than WS's activities. Damage management efforts by individuals with limited training and experience would be more likely to take non-target species, including T&E species. Without the Federal assistance available from WS, some livestock producers may be motivated to consider use of more economical forms of control than those practiced by WS. Illegal use of toxicants represents one of the cheapest forms of predator removal, but it also presents the greatest environmental risks. Risks to T&E species would probably be greater under Alternatives 2 and 6 than for any other alternative.

4.3.4.3 Alternative 3 - Fully Integrated Wildlife Damage Management (IWDM) for Multiple Resources and Land Classes: (Proposed Action).

The analysis is similar to Alternative 1. WS has consulted with the USFWS regarding the nationwide program and would continue to implement all applicable measures identified by the USFWS to ensure protection of T&E species. M-44s would not be used in areas identified by USFWS as *"occupied gray wolf or grizzly range."* Implementation of this alternative may slightly increase the risk to wolves than would Alternative 1, but WS can currently use M-44s on private lands in the analysis area where there are signed *Agreements for Control*.

4.3.4.4 Alternative 4 - Non-lethal Control Required Prior to Lethal Control.

As noted throughout the document, Alternative 4 is similar to the existing program because many livestock producers utilize non-lethal methodologies on a voluntary basis. The impacts of Alternative 4 on T&E species are the same as those identified for Alternative 1.

4.3.4.5 Alternative 5 - Corrective Control Only.

The analysis for Alternative 5 would be similar to the analysis for Alternatives 1. Although the use of predator damage management methods under Alternative 5 may differ from the current program, the shift would not change the low risk factors associated with any of the methods. The risks posed by corrective

control would be no different than the risks posed by the same methods used under a strategy that included preventive damage management. The impacts of Alternative 5 on T&E species are similar to those identified for Alternative 1.

4.3.4.7 Alternative 7 - Predator Damage Management with Only Mechanical Methods: (No Use of Chemicals).

The analysis would be the same as Alternative 1 for the mechanical methods. Overall level of risk to T&E species would be reduced slightly because there would be no risk associated with M-44 use.

4.3.5 Cost-effectiveness of WS activities.

NEPA does not require preparation of a specific cost-benefit analysis, and consideration of this issue would not be essential to making a reasoned choice among the Alternatives being considered. However, cost-effectiveness of WS's activities was a concern with some commenters during the public involvement process, and a specific cost-benefit analysis of a major component WS's activities was prepared.

A cost-benefit analysis of WS activities as conducted during the decades of widespread toxicant use would likely show a much higher benefit per unit cost than predator damage management programs as currently practiced. Although certain toxicants were cheaper and very effective at keeping predator numbers and predator losses low, there were valid concerns about some of the environmental impacts. Our social value system has essentially established limits on how cost-effectively predator damage management can be conducted. As restrictions on use of damage management methods increase, cost-effectiveness of damage management is reduced.

Connolly (1981) examined the issue of cost effectiveness of Federal predator damage management 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 damage management methods believed to be effective but less environmentally preferable, such as toxic baits. In addition, 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. USDA (1994) stated that *"Cost effectiveness is not, nor should it be, the primary goal of the ADC program."* Additional constraints, such as environmental protection, land management goals, and others, are considered whenever a request for assistance is received (USDA 1994). These constraints increase the cost of the program while not necessarily increasing its effectiveness; yet they are considered a vital part of the WS program.

4.3.5.1 Alternative 1 - Current Analysis Area WS Program: (No Action).

This cost-benefit analysis is limited to quantifiable values and does not consider a number of values that would be difficult to measure. When sheep on rangelands are repeatedly harassed by predators, for example, they become extremely *spooky* and do not disperse and feed normally. Therefore, they would not find the quality and quantity of feed that they would have if unstressed, resulting in lower lamb weights at the end of the grazing season. This is a form of predator damage, but it would be difficult to quantify. Jahnke et al. (1987) and Wagner (1988) discussed additional examples of indirect predator damage, including increased labor costs and producer efforts to find sheep scattered by predators and range damage related to the tighter herding required in response to the presence of predators. This analysis likewise does not consider the value that some individuals may place on being able to see or hear coyotes more often when they visit Wyoming rangelands, nor does it consider the unintentional harm or indirect benefits to certain wildlife species.

Cost-effectiveness of WS's predator damage management can be assessed by looking at the difference between: 1) the value of actual losses with the program in place, plus the cost of the program, and 2) the value of what losses could reasonably be expected without the program in place. This cost-benefit

analysis is limited specifically to WS's efforts to protect sheep in the analysis area during FY 95 for two primary reasons: 1) a critical part of the determination of cost-benefit is the estimation of what losses might reasonably be expected to be in the absence of a damage management program and 2) sheep are the only class of livestock for which studies have been specifically conducted to look at this issue. FY 95 is the first full year for which Wyoming WS has data available under the MIS reporting system. Availability of data through this system allowed for closer estimation of the amount of money spent specifically for the protection of sheep.

USDA (1994) cites four studies where sheep losses to predators were documented with no damage management program in place (Table 4-6). Annual predation loss rates during these studies varied from 6.3-29.3% for lambs and 0 to 20.8% for adult sheep. The unweighted average rate of loss to predators was about 7% for sheep and 17% for lambs. Conditions in Wyoming would be similar as in Montana (Henne 1977, Munoz 1977), and it is reasonable to assume losses without damage management could be about 16% for adult sheep and 24% for lambs. However, for purposes of this analysis, we will conservatively assume loss rates for sheep and lambs could be expected to be 7% and 17%, respectively, in the absence of a damage management program.

Source	Location	Year	Sheep	Lambs
Henne (1977)	Montana	1974/1975	20.8%	29.3%
Munoz (1977)	Montana	1975/1976	16%	24.3%
McAdoo and Klebenow (1978)	California	1976	Losses were not reported.	6.3%
Delorenzo and Howard (1976)	New Mexico	l975	0%	12.1%
Delorenzo and Howard (1976)	New Mexico	l976	0%	15.6%

Data provided by the WAS (1996) suggests that actual predator losses in cooperating counties within the analysis area in 1995 were 1,365 adult sheep and 7,735 lambs, valued at an average price of $90 each. Table 4-7 shows that based on expected predation loss rates in the absence of a damage management program, the projected losses for sheep producers in the analysis area in 1995 could have been more than $1.3 million. WS expenditures for predator damage management to protect sheep in the analysis area in FY 95 were estimated to be $128,000. This figure includes salaries and benefits for field, supervisory, and administrative staff, vehicle and aircraft expenses, supplies and equipment, and overhead for all activities to protect sheep in the analysis area during FY 95. The difference between 1) the value of actual 1995 losses, plus the cost of the damage management program, and 2) the value of what losses could reasonably be expected to be without a damage management program is conservatively estimated at $401,740. This amount, divided by the cost of the FY 95 program, yields a positive cost-benefit.

Table 4-7. Actual and Hypothetical Sheep and Lamb Losses to Predators in the Eastern Wyoming Analysis Area for FY 1995

	Actual losses w/ WS (% predation)		Projected losses w/out WS (% predation)		Difference	Avg. 1995 $ Value/Head	Total Saved
Sheep	1,365	(2.1	4,550	(7	3,185		$286,350

	Actual losses w/ WS (% predation)	Projected losses w/out WS (% predation)	Difference	Avg. 1995 $ Value/Head	Total Saved
Lambs	7,735 (12.6)	10,436 (17)	2,701	$90	$243,090
Total	9,100	14,986	5,886		$529,740

WS's Budget to Protect Sheep and Lambs in eastern Wyoming = $128,000 in FY 1995.

4.3.5.2 Alternative 2 - No Predator Damage Management in the Analysis Area.

The economic effects of implementing this alternative would be similar to implementation of Alternative 6 with regard to impacts on livestock producers. No Federal funds would be expended by WS, so cost-effectiveness of the Federal program would not be an applicable issue. However, producer losses to predation would likely be higher.

4.3.5.3 Alternative 3 - Fully Integrated Wildlife Damage Management (IWDM) for Multiple Resources and Land Classes: (Proposed Action).

Initial costs associated with using M-44s on BLM and National Forest System lands, the LPC on private lands, DRC-1339 for raven damage reduction, or immobilizing/euthanizing chemicals should not significantly increase the costs of the program. Once M-44s are integrated into the current program, costs are expected to be less than those of other more labor-intensive methods since maintenance of M-44s in the field should be less than current available methods. Use of M-44s would allow WS to be more effective in resolving predation problems. Their use would probably increase the cost-effectiveness of the program over the long term.

Initial costs associated with implementation of LPC use in the program would be slightly higher for producers and WS than for currently employed methods. However, once LPCs are integrated into the current program, costs are expected to be similar to those of other labor-intensive methods. WS would coordinate LPC use with the WDA and producers would only have to pay to replace collars that were lost or punctured on their property. After the predation problem was solved on a particular ranch and the collars were no longer needed, they would then become available to be used on sheep at other ranches. If use of LPCs allowed WS to be more effective in resolving predation problems, their use would probably increase the cost-effectiveness of the program over the long term.

4.3.5.4 Alternative 4 - Non-lethal Control Required Prior to Lethal Control.

Under this alternative, WS's costs would be lower, but producers' losses to predation would likely be higher. There is at least some evidence to suggest that preventive damage management on summer sheep grazing areas would provide a positive cost-benefit, as discussed under Alternative 1 (Gantz 1990, Wagner 1997). Packham (1973) documented the results from studies done on four different areas in Idaho. His data suggests that for every dollar spent for helicopter damage management to remove coyotes on the study areas, an average of $5.20 worth of sheep and lambs were saved. A similar cost-benefit seemed apparent when comparing increased helicopter aerial hunting on the Caribou National Forest in the winter of 1994-95 with the reduced level of coyote predation on sheep in the summer of 1995. By spending an additional $16,500 in cooperator-supplied dollars for helicopter aerial gunning in the winter of 1994-95, losses to coyote predation were about $89,000 lower than they had been the previous summer. Numbers of sheep present were similar during both summers. This suggests that for every additional dollar spent

by sheep producers for preventive damage management saved $5.40 worth of sheep and lambs (Collinge 1996).

4.3.5.5 Alternative 5 - Corrective Control Only.

Under this alternative, WS's costs would be lower, but producers' losses to predation would likely be higher. Losses of all livestock to mountain lion and bear are currently on a corrective control only basis and would not be expected to change. Losses of lambs might approach the levels described in the literature and in Table 4-7, as lamb losses often go undetected until the lambs are large enough that carcasses may readily be found. Adult sheep losses would increase, although not to the extent suggested in Table 4-7. While speculative, adult sheep losses could be about 4.5% and lamb losses could be about 15%.

As with the current program, Alternative 5 would provide little direct protection for wildlife. Incidental benefits to wildlife living in areas where livestock protection is afforded could occur, but less than in Alternative 1. No direct economic benefit to wildlife would be attributed to Alternative 5. The economic costs of administering a corrective control only program would be expected to increase, due to increased aerial hunting and increased costs associated with confirming losses prior to initiating wildlife damage management techniques.

If preventive damage management is one of the most cost-effective components of the current program (Wagner 1997), then the overall cost-benefit ratio for Alternative 5 (corrective only) would probably be lower than for Alternative 1.

4.3.5.6 Alternative 6 - Technical Assistance Program.

Costs to implement this alternative would be much lower than the current program. Numbers of WS personnel could be reduced to only those needed to provide technical assistance and make recommendations to requesters wishing to conduct their own control work. No monies would be spent for operational activities and program costs would probably decrease by at least two-thirds. Livestock owners would likely have to absorb the cost of hiring private control agents or doing the work themselves. Losses to predators would probably increase substantially, and some sheep operations would probably not be able to afford to stay in business.

4.3.5.7 Alternative 7 - Predator Damage Management with Only Mechanical Methods: (No Use of Chemicals).

Cost-effectiveness would likely be lower under this alternative than under the current program. Wildlife damage problems can most effectively be resolved when the largest variety of damage management methods are available to choose from for each particular damage situation. Chemical methodologies are often less labor-intensive (i.e., M-44s, gas cartridge) in some cases are more humane than alternatives, and above all, are legally labeled for use. The M-44, a chemical method that would be precluded under this alternative, are one of the cheapest damage management methods to use because they require relatively little maintenance as compared to traps or snares, and the LPC is very selective and sometimes effective in reducing damage when other methods are ineffective.

4.3.6Summary of WS's Impacts

Table 4-8 presents a relative comparison of the anticipated impacts of each of the alternatives as they relate to each of the major issues identified in Chapter 2.

Table 4-8 Relative Comparison of Anticipated Impacts From Alternatives

Issues/ Impacts	*Alt. 1 Current Program*	*Alt 2 No Program*	*Alt. 3 Proposed Action*	*Alt. 4 Non-lethal Control*	*Alt. 5 Corrective Control*	*Alt. 6 Tech. Asst. Only*	*Alt. 7 Mechanical Methods*
Cumulative impacts on wildlife	low	low/mod	low	low	low	low/mod	low
Effectiveness and selectivity of methods	good effective-ness and selectivity	probably lower than Alt. 1, 3, 4, 5, 7	greatest effective-ness and selectivity	similar selectivity as Alt. 1 - lower effective	lower effectiveness than Alt.1/3, but similar selectivity	probably lower than Alt. 1,3,4,5,7	probably lower than Alt. 1, 3, 4, 5
Risks to public and pets	low	probably greater risks than Alt. 1, 3, 4, 5, 6, 7	slightly lower risks than Alt. 1	similar risks as Alt. 1	slightly higher risk than Alt. 1	probably greater risks than Alt. 1, 3, 4, 5, 7,	similar risks to Alt. 1, lower than Alt 3
Impacts to T&E species	low risks	probably greater overall risks than Alt. 1, 3, 4, 5, 7	similar risks as Alt. 1	similar risks as Alt. 1	similar risks as Alt. 1.	probably greater overall risks than Alt. 1, 3, 4, 5, 7	similar risks as Alt. 1
Cost-effectiv eness	good	not applicable	best	similar to Alt. 1	similar to Alt. 1 or 3	not applicable	lower than Alt 1 or 3

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APPENDIX A

LITERATURE CITED

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ADC Directive 2.430 Euthanizing and Immobilizing Agents

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APPENDIX B

Abundance: The number of individuals in a population of a species in a given unit of area

Allotment: A specific area of public lands within which grazing by one or more livestock operators is authorized.

Animal Behavior Modification: The use of scare tactics/devices to deter or repel animals that cause loss or damage to resources or property. It includes the use of electronic distress sounds, propane exploders, pyrotechnics, lights, scarecrows.

Animal/Livestock Husbandry: The use of livestock management practices, such as shed lambing, night penning, or employing herders or guard dogs to reduce mortality from weather, predation or other causes.

Animal Rights: A philosophical and political position that animals have inherent rights comparable to those of humans.

Animal Welfare: Concern for the well-being of individual animals, unrelated to the perceived rights of the animal or the ecological dynamics of the species.

Behavior Modification: see "Animal Behavior Modification"

Canid: A coyote, dog, fox, wolf or other member of the dog (Canidae) family.

Carnivore: A species that primarily eats meat (member of the Order Carnivora).

Carrying Capacity: The number of animals a given unit of habitat can support.

Compensation: Monetary reimbursement for loss of agricultural resources.

Confirmed Losses: Wildlife-caused losses or damages verified by APHIS-ADC. These figures usually represent only a fraction of the total losses.

Corrective Damage Management: Management actions applied when damage is occurring or after it has occurred.

Denning/Den Hunting: The process of finding burrows where predators (primarily coyotes) have their young and then euthanizing the pups. The adult predators may also be euthanized.

Depredating Species: An animal species causing damage to or loss of crops, livestock, other agricultural or natural resources, or wildlife.

Depredation: The act of killing, damaging or consuming animals, crops, other agricultural or natural resources, or wildlife.

Direct Control: Administration or supervision of wildlife damage management by ADC, often involving direct capture or intervention to take depredating animals.

Diversity: The distribution and abundance of living organisms.

Draw Station: A livestock carcass, bone pile, or scented control area for attracting target species, particularly coyotes.

Endangered Species: Federal designation for any species that is in danger of extinction throughout all or a significant portion of its range.

Environment: The surrounding conditions, influences, or forces that affect or modify an organism or an ecological community and ultimately determine its form and survival.

Environmental Assessment (EA): An analysis of the impact of a planned action to the human environment to determine the significance of that action and whether an EIS is needed.

Environmental Impact Statement (EIS): A document prepared by a Federal agency to analyze the anticipated environmental effects of a planned action or development, compiled with formal examination of options and risks.

Eradication: Elimination of specific wildlife species, generally considered pests, from designated areas.

Forage: Food for animals, especially when taken by browsing or grazing.

Furbearer: An administrative or legal grouping of mammal species harvested for their fur.

Habitat: An environment that provides the requirements (i.e., food, water, and shelter) essential to development and sustained existence of a species.

Habitat Modification/Management: Protection, destruction or modification of a habitat to maintain, increase or decrease its ability to produce, support, or attract designated wildlife species.

Harvest Data: An estimate of the number of animals removed from a population.

Harvest Rate/Level: For any given wildlife species, a harvest ceiling established by wildlife management specialists to regulate the harvest of a species. This value represents a proportion of the population that can be taken without adversely impacting the long-term maintenance of the population.

Humaneness: The perception of compassion, sympathy, or consideration for animals from the view point of humans.

Integrated Pest Management (IPM): The procedure of integrating and applying practical management methods, to keep pest species from reaching damaging levels while minimizing potentially harmful effects of pest management measures on humans, non-target species, and the environment, incorporating assessment methods to guide management decisions.

Integrated Wildlife Damage Management: (See Integrated Pest Management) The IPM approach modified to the objective of managing damage rather than pest animal populations.

Lethal Management Methods/Techniques: Wildlife damage management methods that result in the death of animals (e.g., M-44s, aerial shooting, calling and ground shooting, and denning).

Local Population: The population within an immediate specified geographical area causing damage to human health and safety, to other wildlife, or to forest, range, and agricultural resources.

Long-Term: An action, trend, or impact that affects the potential of an event over an extended period of time.

Magnitude: Criteria used in this EA to evaluate the significance of impacts on species abundance. Magnitude refers to the number of animals removed in relation to their abundance.

Non-Lethal Control Methods/Techniques: Wildlife damage management methods or techniques that do not result in the death of target animals (e.g., live traps, repellents, fences, etc.).

Non-Target Species/Animal: An animal or local population that is inadvertently captured, killed, or injured during wildlife damage management. The same species may be either a target or non-target animal, depending on the damage management.

Offending Animal/Species: The individual animal or animals within a specified area causing damage to public health and safety, to other wildlife, or to forest, range and agricultural resources.

Omnivore/Omnivorous: An animal that eats both animal and plant matter; a generalist, opportunistic feeder that eats whatever is available.

Open Range: Unfenced grazing lands.

Pesticide: A chemical substance used to control pest animals.

Pesticide Use Proposal (PUP): A procedure whereby, a petition is submitted to government agency(ies), and must be approved by the agency(ies), before a pesticide, in a specific formulation and purpose can be used.

Population: A group of organisms of the same species that occupies a particular area.

Predacide: A toxicant used to control or manage predators or damage caused by predators.

Predator: An animal/species that kills and/or consumes another animal.

Preventive Damage Management: Management applied before damage begins.

Prey: An animal that is killed and consumed by a predator.

Public Land: Land that is owned and controlled by a government agency (i.e., Federal, state, regional, county or municipal jurisdiction).

Pyrotechnics: Fireworks or projectiles used to frighten wildlife.

Range Lambing: Lambs born on the open-range or pasture situation.

Rangeland: Land on which the natural plant cover is made up primarily of native grasses, forbs, or shrubs valuable for forage.

Raptors: Carnivorous bird species (e.g., owls, hawks, falcons) that prey on other birds, amphibians, reptiles, and mammals.

Registered Chemical: A chemical that has been approved by the appropriate governmental agency(ies), such as the EPA or MDA, for use in a specific formulation and for a specified purpose.

Repellent: A substance with taste, odor or tactile properties that discourages specific animals or species from using a food or place.

Requester: Individual(s) or agency(ies) that requests wildlife damage management assistance from ADC.

Selectivity: Damage management methods that affect specific animals or animal species responsible for damage without adversely affecting other species.

Sensitive Species: Species designated, usually in cooperation with the state agency responsible for managing the species, as sensitive. Sensitive species are those that: 1) are under status review by the USFWS/NMFS; or 2) whose numbers are declining so rapidly that Federal listing may become necessary; or 3) typically have small and widely dispersed populations; or 4) inhabit ecological refuge or other specialized or unique habitats. Sensitive species are managed under the same criteria as T&E species pending formal listing as a T&E species or until it is delisted.

Shed Lambing: Housing ewes and newborn lambs in pens or sheds to provide food, shelter, and medical care during and immediately after birth.
Short-Term: An action, trend, or impact that does not have long lasting affects to the reproductive or survival capabilities of a species.

Significant Impact: An impact that will cause important positive or negative consequences to man and his environment.

Take: The capture or killing of an animal.

Target Species/Animal/Population: An animal or population toward which wildlife damage management is directed to alleviate damage to agriculture and non-agriculture resources. The same species may be either a target or non-target, depending on the situation.

Technical Assistance: Advice, recommendations, information, demonstrations, and materials provided to others for managing wildlife damage problems.

Threatened Species: Federal designation for species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Total Harvest: The total number of individuals intentionally taken by humans from a population. Harvest does not include natural or accidental mortality.

Toxicant: A poison or poisonous substance.

Unconfirmed Losses: Losses or damage reported by resource owners or managers, but not verified by ADC.

Wilderness Study Area (WSA): Undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation, and managed to preserve its natural conditions.

Wildlife: Any wild mammal, bird, reptile or amphibian.

Wildlife Damage Management: Actions directed toward resolving livestock or wildlife predation, protecting property or safeguarding public health and safety in a coordinated, managed program.

Work Plan: A management plan developed jointly by ADC and/or the BLM, Forest Service, WGFD, and WDA specifying when, where, how, and under what constraints wildlife damage management would be conducted. If applicable, the plan may include a map showing planned damage management, restricted damage management, no damage management, and special protection areas.