ENVIRONMENTAL ASSESSMENT

PREDATOR DAMAGE MANAGEMENT IN WASHINGTON

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1.0 PURPOSE AND NEED FOR ACTION

1.1 Introduction

The U.S. Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), Wildlife Services (WS) program, (formerly called Animal Damage Control (ADC)), has received requests in the past, and is currently receiving requests, to conduct predator damage management in various locations in the state of Washington. The purpose of these activities is to reduce or alleviate damage to livestock (primarily sheep and cattle), poultry, property, natural resources, and human health and safety. WS is the Federal program authorized to manage animals which damage these resources. WS's authority comes from the Animal Damage Control Act of March 2, 1931, as amended (46 Stat. 1486; 7 U.S.C. 426-426c) and the Rural Development, Agriculture, and Related Agencies Appropriations Act of 1988.

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. Some species have adapted well to living near humans, as is evidenced by increasing populations of urban wildlife. However, this growing interface between people and wildlife has created a variety of localized human/wildlife conflicts. While some segments of society strive for protection of their own interests, others strive for the protection of all wildlife. The ADC Final Programmatic 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 is generally 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 values is required to manage the balance between human and wildlife needs. In addressing conflicts, wildlife managers must consider not only the needs of those directly affected by wildlife damage but a range of environmental, sociocultural and economic considerations as well.*

This environmental assessment (EA) examines potential impacts of the WS program as it involves resource conflicts with predatory animals: coyote (*Canis latrans*), black bear (*Ursus americanus*), grizzly bear (*Ursus arctos horribilis*), gray wolf (*Canis lupus*), cougar (*Puma concolor*), red fox (*Vulpes vulpes*), bobcat (*Felis rufus*), badger (*Taxidea taxus*), feral/free ranging dog (*Canis*

familiaris), and raven (*Corvus corax*). The Washington WS program conducts wildlife damage management on various lands throughout Washington. Any wildlife damage management conducted by WS would continue to be undertaken in compliance with relevant laws, regulations, policies, orders, and procedures, including the Endangered Species Act. None of the proposed activities would result in habitat modifications.
Normally, according to the APHIS procedures implementing the National Environmental Policy Act (NEPA), individual wildlife damage management actions are categorically excluded [7 C.F.R. 372.5(c), 60 Fed. Reg. 6,000, 6,003 (1995)]. To evaluate and determine if there may be any potentially significant or cumulative impacts on the human environment from the proposed program, we have decided to prepare this environmental assessment. This EA documents the analysis of the potential environmental effects of the proposed wildlife damage management activities in Washington. This analysis relies mainly on existing data contained in published documents and the ADC programmatic EIS (USDA 1994) to which this document is tiered.

Notice of the availability of this document has been published in local newspapers and sent to interested parties, consistent with the agency's NEPA procedures, to allow the public opportunity to obtain and comment on this document.

1.2 Purpose and Scope

The purpose of predator damage management activities in Washington is to reduce or alleviate damage to livestock, poultry, property, natural resources, and public safety. Current program activities are conducted on private and municipal lands throughout Washington, on State lands which are leased for livestock grazing and managed by the Southeast and Northeast Regions of the Washington Department of Natural Resources (WDNR), on U.S. Department of Defense (DOD) lands, and on U.S. Fish and Wildlife Service (FWS) wildlife refuges. The WDNR lands are generally interspersed with or adjacent to private ranch lands and are managed, in part, for livestock grazing. FWS and DOD may contract with WS for control measures for the protection of wildlife, livestock, or other resources at specific refuges or military installations. FWS and DOD would take lead responsibility for site specific analysis of predation management measures as they relate to NEPA. Actions on FWS refuges and DOD lands will not be analyzed further in this document.

Except for projects covered otherwise under NEPA, this EA addresses all lands that are or could come under WS Agreement for predator control in Washington. The standard ADC Decision Model (USDA 1994) and ADC Directive 2.201 will be the site-specific procedure for NEPA compliance for individual actions. The ADC Decision Model is also discussed in Chapter 2.1 of this document.

The scope of the current program can be shown using the most recently compiled data from recent typical years of operation. The current program will be used as a baseline for comparing the various alternatives. An expanded program with a broader scope will be proposed as an alternative to the current program, and will be defined later in this document.

According to the WS Management Information System (MIS 1995-1996), in fiscal years (FY) 1995-1996, Washington WS had active agreements to work on approximately 493,000 acres, or about 1.2 of the State's total acreage. Approximately 5 (25,000 acres) of the total acres under agreement were WDNR lands. Municipal lands also included only a small fraction of the lands under agreement.
In fiscal years 1995 and 1996, the bulk of WS's operational assistance occurred in Adams, Asotin, Benton, Columbia, Franklin, Garfield, Grant, Island, Klickitat, Lincoln, Skagit, Walla Walla, Whitman, and Yakima counties. Operational assistance was contingent upon the requester providing the major share of the funding needed for WS to provide field personnel and services. Non-operational assistance, such as technical assistance or advice, was provided at no charge to the requester. Under the current program, the areas where WS may provide future operational assistance may change slightly in response to new requests for assistance and/or termination of current agreements, but the overall scope of the project would remain similar. Furthermore, a periodic reevaluation of the validity of this EA would address any substantial changes that might occur. Typically, the WS Program conducts seasonal or part-time work in most locations and may spend only a few hours a year at any single place trying to resolve a problem.

1.3 Need for Action

The impact of predation on livestock resources can be serious. According to survey data collected by the National Agricultural Statistics Service (NASS 1995), predators killed 368,050 head of sheep and lambs in the United States during 1994. These losses were valued at $17.7 million. Coyotes were the primary predator, accounting for 66 of the losses, or $11.5 million (243,800 head). NASS (1996) valued the national cattle and calf losses to predators in 1995 at $39.6 million (117,400 head). Coyotes were responsible for 59 of these losses.

Livestock production in Washington is a sizeable industry, and predation on livestock represents a large financial loss to the State's economy. Total sheep, lamb, and wool production in Washington, as reported by the Washington Agricultural Statistics Service (WASS) (1996), was valued at $3.3 million in 1995. Total cattle and calf production was valued at $451.9 million in the same year. In their most recent survey on death losses in cattle and sheep in Washington, WASS (1989) estimated that in 1988 predators killed 4,841 sheep, valued at approximately $245,000. More sheep were lost to coyote predation than any other cause of death, accounting for 3,903 head or 30 of the total sheep death loss. Of the losses to predators, predation by

dogs was the second most prevalent, followed by cougars, eagles, bears, and others. WASS valued predation losses for cattle and calves in Washington at $1.2 million. A total of 2,124 calves and 73 cows were reported killed by predators. Again, coyotes were responsible for most of the losses to predators ($978,000), with losses from dogs, bears, cougars, and other predators following in order of predominance.

Studies in western states have shown that coyotes typically inflict the highest 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 (Nass 1977). In a Wyoming-based study, Tigner and Larson (1977) found that coyotes were also the predominant predator on sheep throughout the state, and essentially the only predator during winter.

Although bear and cougar predation on livestock has been secondary to that of coyotes, State and Federal officials are expecting increases in black bear and cougar conflicts as a result of Washington State Initiative 655 which was approved by voters in 1996. Initiative 655 banned hunters' use of hounds in the pursuit of bear and cougar and also banned the use of bait in hunting black bear. Although State and Federal agencies are still allowed to remove depredating animals using these techniques, hunter harvest is expected to drop significantly for both species. Increases in bear and cougar conflicts occurred in California and Oregon following passage of similar Initiatives. It is likely over the next several years that WS will be requested to respond with operational assistance to an increasing number of bear and cougar incidents.

A minor, but locally troublesome, predator of livestock in Washington is the raven. The raven is an omnivorous species known to feed on carrion, crops, eggs, birds, small mammals, amphibians, reptiles, fish, and insects (Nelson 1934). Larson and Dietrich (1970) noted that ravens are sometimes responsible for lamb mortality on spring lambing ranges. In Washington during FY 1995, WS verified $1,950 in raven damage to calves and cattle (MIS 1995). Damage typically involves ravens pecking out the eyes of calves or lambs. During FY 1994-1996, WS recorded a total of $4,650 in damages by ravens to livestock, crops, and property (MIS 1994, 1995, 1996). Actual damages were most likely higher, because not everyone reports their losses to WS.

Some predators also negatively impact property and agricultural resources. For example, black bears cause serious damage in private timber plantations each spring by stripping bark to feed on the cambium layer of 20-25 year-old conifers. Bear-damaged trees often die, and scores of trees may be damaged in each feeding area. Bears are also attracted to apiaries where they break open bee hives to consume the honey, oftentimes killing or dispersing the bee colonies. Coyotes and badgers occasionally damage ditch banks and other irrigation structures, field crops, and roads while excavating dens or digging for rodents. Ravens and coyotes sometimes damage

silage storage bags by pecking and digging at the fabric in search of insects and rodents. This activity causes spoilage of livestock feed.

Public safety is another important area of responsibility for WS. Although attacks are rare, black bears, cougars, and coyotes occasionally pose safety threats when they habituate to urban or residential locations or recreation areas used for picnicking, hiking, or camping. Although WDFW has lead responsibility for human and wildlife conflicts involving black bear and cougar, WS periodically assists WDFW, upon request, by responding to safety and nuisance incidents.

Other public safety issues occur at airports when coyotes, foxes, or badgers frequent airfields. Federal Aviation Administration (FAA) regulations require public airports to provide for safe aircraft operations in regard to wildlife hazards, and through a 1989 Memorandum of Understanding, FAA authorizes WS to assist airports in managing those hazards. Wildlife strikes cost the commercial air transport industry in the United States an estimated $200 million annually in structural damages alone (Linnell et al. 1996). In 1994, FAA recorded a reported total of 2,220 wildlife strikes to civilian aircraft. About 97 of these involved birds. However, mammals caused about $6.9 million in damages (Dolbeer 1996). Mammals most frequently damaged landing gear but have the potential during takeoff to cause engine failure in turbine powered aircraft if ingested into an engine. Any structural damage to aircraft compromises the safety of passengers, crew, and people on the ground.

1.4 Issues

The following predator control management issues [developed fully and assessed in the programmatic EIS (USDA 1994)] were identified as relevant to this process:

1. Effects on target species populations

2. Effects on nontarget species populations, including threatened and endangered (T&E) species

3. Effects of WS control methods on public safety

4. Humaneness of control techniques

5. Effectiveness of the WS program

Two issues were considered but rejected from detailed analysis from the alternatives since it was determined that the project would have little or no potential to impact these resources. They were:

- Hunting and non-consumptive uses of wildlife, such as public viewing, would not be greatly affected, because most WS operations are conducted on private property and a relatively small number of animals are removed at any given location.

- This project would not have a significant impact on cultural resources. Correspondence between WS and the Washington State Office of Archaeology and Historic Preservation is included in Appendix 6.

2.0 ALTERNATIVES

Of the 13 alternative courses of action developed in the programmatic EIS, the following are relevant to and were considered in this process:

2.1 Alternative 1: Current Program Alternative

Alternative 1, the Current Program Alternative, is also called the "No Action" alternative. The "No Action" alternative is a procedural NEPA requirement (40 CFR 1502.14(d)), and is a viable and reasonable alternative that could be selected. No action, in this case, is no change from the current program. Current operations include WS direct control and technical assistance applied on a case-by-case basis to use the most appropriate, effective, and biologically sound methods available to resolve damages caused by predators. This approach is known as integrated wildlife damage management and is analyzed and discussed in the ADC EIS (USDA 1994). It is composed of a variety of methods that are implemented based on the ADC Decision Model (Figure 1).

WS Decision Making Process

The ADC EIS describes the procedures used by WS personnel to determine management strategies or methods applied to specific damage problems (USDA 1994 ch. 2, pp. 23-35 and Appendix N).

As depicted in the ADC Decision Model, consideration is given to the following factors before selecting or recommending control methods and techniques:

- Species responsible for damage
- Magnitude, geographic extent, frequency, and duration of the problem
- Status of target and nontarget species, including T&E species
- Local environmental conditions
- Potential biological, physical, economic, and social impacts
- Potential legal restrictions

- Costs of control options (the cost of control may sometimes be a secondary concern because of overriding environmental and legal considerations)

The WS decision making process is a standardized procedure for evaluating and responding to damage complaints. WS personnel frequently are contacted only after requesters have tried nonlethal 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 is continued to assess the effectiveness of the strategy. If the strategy is effective, the need for active management is ended.

As an example, coyote predation on livestock may occur whenever vulnerable farm animals are present. In many cases, no cost-effective method or combination of methods that permanently stops or prevents coyote predation are available. When damage continues intermittently over time, the WS field representative and rancher monitor and reevaluate the situation frequently. If one method or combination of methods fails to stop damage, a different strategy is implemented. The ADC EIS provides more detailed examples of how the ADC Decision Model is implemented for coyote predation on sheep (USDA 1994).

In terms of the ADC Decision Model, most damage management efforts consist of a continuous feedback loop between receiving the request and monitoring the results, with the control strategy reevaluated and revised periodically.

Under the current program, WS receives requests for operational assistance from and/or enters into Cooperative Agreements with private landowners, livestock managers, municipalities, and wildlife management agencies such as FWS and WDFW. A small number of requests for control work on Washington Department of Natural Resources (WDNR) land come from livestock permittees, and projects are coordinated with WDNR. WS provided operational assistance or direct control under 48 cooperative agreements in FY 1996. Two of these were for the protection of public safety at airports, and the remainder were in response to coyote predation on livestock, primarily sheep and cattle. WS did not provide operational assistance with any cougar or bear complaints in FY 1996. Under this alternative, WS would continue to provide operational assistance, contingent upon funding on behalf of the requestor, when livestock, other domestic animals, or sensitive wildlife species are killed or threatened by predators, or when predators damage property or threaten public health or safety.

Technical assistance, (advice on non lethal and lethal control), is an important part of an integrated pest management program, and is included in the variety of methods available for resolving wildlife conflicts. Technical assistance examples are described in detail in Appendix 2 - WS Wildlife Damage Management Methods. Under the current program, WS provides technical assistance at no charge to the recipient. In fiscal year 1996, WS handled 154 requests for technical assistance in regard to coyote damage to agriculture (77 requests), property and pets (54 requests), public health and safety (21 requests), and natural resources (2 requests). WS also provided technical assistance on 7 black bear, 3 cougar, 4 feral dog, and 4 raven complaints.

Although WS did not provide operational assistance for any bobcat, fox, or raven complaints in FY 1996, infrequent requests for assistance have been received in previous years and may be similarly expected in the future. WS would continue to respond to requests from airports in Washington where coyotes, foxes, or other predators were considered a threat to aviation safety.

WS is also authorized to cooperate with State and Federal wildlife management agencies in controlling problem gray wolves and grizzly bears. Environmental analysis and interagency guidelines for resolving grizzly bear and wolf problems have been established in the "Draft Contingency Plan for the Control of Problem Wolves in Washington State" (1994) and the "Guidelines for Determining Grizzly Bear Nuisance Status and for Controlling Nuisance Grizzly Bears in Northern Idaho and Washington" (1984, revised 1989).

The methods used in the current program include technical assistance and direct control, such as: animal husbandry, livestock guarding dogs and other guard animals, fencing/exclusion devices, frightening devices, harassment, foothold (leghold) traps, cage and culvert traps, snares, aerial shooting, calling/shooting, M-44 device (sodium cyanide), denning/den fumigants, chemical immobilizing and euthanizing agents, and hunting dogs. The bird toxicant, DRC-1339, is used for raven control. Appendix 2 provides detailed descriptions of these methods, and Table 1 summarizes the predator damage management methods that would be allowed under each alternative.

Wildlife-borne diseases which may be transmissible to humans, livestock, or pets (such as rabies, parvo virus, and distemper) also occur in Washington. There are currently no major outbreaks of these diseases in predator populations in the state. If an outbreak were to occur, WS would provide assistance upon request of the Health Department or other appropriate agency.

The current program is funded in large part under Cooperative Agreements by the individuals or organizations requesting assistance. Federal funds comprise less than 40 of the total budget and are used primarily to cover the costs of technical assistance, equipment, and administration.

2.2 Alternative 2: Technical Assistance Alternative

Alternative 2 would allow WS to provide only technical assistance or advice. Under this alternative, WS would make recommendations on the use of lethal and nonlethal control methods. WS would demonstrate or advise cooperators on the use of all the methods listed under Alternative 1, with the exception of the M-44, DRC-1339, and aerial shooting.

No lethal predator damage control activities by WS would be authorized except when emergency control was necessary for public safety.

Table. 1. Comparison of the alternatives

Management Method	Alt. 1 Current Program	Alt. 2 Technical Assist.Only[1]	Alt. 3 Nonlethal Before Lethal[2]	Alt. 4 No Program[3]	Alt. 5 Expanded Program
Nonlethal	yes	yes	yes	yes	yes
Trapping/Snaring	yes	yes	yes	yes	yes
Shooting	yes	yes	yes	yes	yes
M-44	yes	no	yes	no	yes
Aerial shooting	yes	no	yes	no	yes
Calling/Shooting	yes	yes	yes	yes	yes

[1]Technical assistance recommendations given to cooperators could result in many of the management methods being used.

[2]All lethal methods could be used if nonlethal methods were not effective.

[3]Many of the management methods could be used by parties other than WS.

2.3 Alternative 3: Nonlethal Before Lethal Methods Alternative

Alternative 3 would require that: 1) potential cooperators show evidence of sustained and ongoing use of nonlethal/husbandry techniques aimed at preventing or reducing predation prior to receiving the services of the WS Program; 2) employees of the WS Program use or recommend as a priority the use of appropriate nonlethal techniques in response to a confirmed damage situation; and 3) lethal techniques would only be used when the use of husbandry and/or nonlethal controls have failed to keep damages below an acceptable level. This alternative is analyzed and discussed in the ADC EIS. The nonlethal methods that can be advised or demonstrated through technical assistance are also discussed in detail in Appendix 2.

2.4 Alternative 4: No WS Program Alternative

Under Alternative 4, WS would not conduct predator control operations. No technical assistance or direct control operations would occur. No operational assistance would be available.

2.5 Alternative 5: Expanded Program Alternative (Proposed Action)

Alternative 5 is the Proposed Action and is similar to the Current Program Alternative. It would allow the same activities and methods. However, damage control efforts would be increased statewide. WS would use the decision model described in Chapter 2.1 and would provide both technical assistance and direct control. WS would work on additional private and WDNR lands, and there would be a potential for a small number of short-term, limited activities on Bureau of Land Management (BLM) and U.S. Forest Service (USFS) lands. If WS received a request to work on USFS or BLM lands, it would coordinate with the appropriate land management agency to ensure consistency with agency resource management plans and to ensure that WS does not conflict with land uses as required by current national level MOU's signed between WS and BLM and WS and USFS. If WS received a long-term or ongoing request for assistance on USFS or BLM lands it would reevaluate this EA and the environmental consequences of such an action.

The adoption of this alternative is contingent upon the availability of increased program funding. WS recently received new funds from the State of Washington, administered by WDFW, for predator damage management during State FY's 1998-1999. The State Legislature provided this funding to allow WS to better respond to agricultural and property damage caused by predators statewide. WS may also assist WDFW in a limited capacity in responding to public safety concerns. The availability of future funding for an expanded program is not known at this time.

3.0 ENVIRONMENTAL CONSEQUENCES

The WS program evaluated the environmental consequences of the management alternatives in the programmatic EIS (USDA 1994). In the development of this EA, issues concerning biological, economic, sociocultural, and physical impacts were identified for evaluation. The results applicable to the development of this EA are incorporated in this analysis and summarized in Table 2. Each alternative is examined against the issues.

3.1 Impact of the Current Program Alternative

3.1.1 Impact on Target Species

The impact of the current program on predator species is the removal of a limited number of animals, primarily coyotes, immediately on and around areas where damage has occurred or may be reasonably expected to occur. Impacts on each species are discussed below.

Coyote - Determinations of absolute densities for coyote populations are often limited to educated guesses (Knowlton 1972). The cost of studies to accurately determine absolute coyote densities over large areas would be prohibitive (Connolly 1992) and would not appear to be warranted for this EA given the coyote's relative abundance. 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 seeming realistic over much of their range.

Although limited to areas surrounding livestock operations, WS data from Washington lend support to these estimates. A review of aerial shooting data shows that up to 3 coyotes/mi^2 were taken in single days from some ranches in eastern Washington. These numbers were observed during the lowest seasonal density of coyotes (just prior to whelping in the spring) and do not account for coyotes that likely remained in areas after the conclusion of WS's efforts. However, as suggested by Knowlton, on a whole, average coyote density appears lower than this. When all single episode aerial shooting operations for eastern Washington were averaged, the take of coyotes was approximately 0.7/mi^2. Again, this number does not account for coyotes that eluded the aircraft, were simply not encountered, or otherwise remained in the area. Because of this, one would expect average densities in those areas sampled to be somewhat higher than 0.7/mi^2.

Since aerial shooting is not generally effective west of the Cascade mountains, it is not typically used in that part of the state and cannot be used as an indicator of coyote abundance. However, as in eastern Washington, coyotes in western Washington can be locally abundant. WS data

based on the number of coyotes removed from given areas indicate localized densities which may exceed 5 coyotes/mi^2. Regional densities would most likely be lower than this.

Although WDFW does not provide population estimates for coyotes in Washington, the coyote population is considered to be generally stable statewide, despite local fluctuations (S. Pozzanghera, WDFW, pers. com.).
Based on a review of the information cited above, coyote densities for purposes of this assessment will be estimated conservatively at 0.7/mi^2, statewide. The 66,536 mi^2 area would then hold an estimated population of about 46,500 coyotes.

Under the current program, the number of coyotes removed would likely be similar to numbers taken in recent years. During FY 1994-1996, WS took an average of 571 coyotes annually in Washington, or about 1 of the estimated population. The average annual private trapper harvest in Washington during the 1995-96 season was 1,770 coyotes (WDFW 1996). Sport hunting and private coyote control efforts undoubtedly account for an additional number of coyotes taken every year, but numbers on this take are not available. For purposes of this analysis, we will assume that this take equals the harvest by private trappers. The combined annual coyote take would then probably average about 4,111 coyotes statewide, or about 9 of the estimated population.

Although local populations of coyotes may be temporarily reduced through actions taken by WS and others, immigration of coyotes from surrounding areas eventually repopulates these areas of lower density. Henke (1992) noted that coyote density in his study area returned to pre-removal levels within 3 months following removal efforts.

A population model developed by Connolly and Longhurst (1975), and revised by Connolly (1995), suggests that coyotes can withstand an annual removal of 70 of their numbers and still maintain a viable population. Evaluating the data using standards established in the ADC EIS (USDA 1994), removal of 9 of the coyote population in Washington would result in cumulative impacts of low magnitude. This conclusion is consistent with the U.S. Government Accounting Office (1990) assessment regarding WS's impacts on coyote populations in the western U.S.

Black bear - WS lethally removed only one bear during FY 1994-1996. Most complaints were handled by WDFW or by the individuals experiencing damage. The recent passage of State Initiative 655 in Washington is expected to reduce the number of black bears harvested by hunters, especially on the west side of the Cascade Mountains. Black bear populations are expected to increase as are the number of bear/human conflicts. WS anticipates receiving more bear complaints during the next several years and may take more bears. However, WS take is

expected to be only a small percent of the number that were traditionally harvested by hunters and is expected to have little impact on bear populations. WS take of black bears is coordinated with WDFW.

Cougar - During FY 1994-1996, WS did not kill any cougars. Removals were handled by WDFW or by the individuals experiencing damage. The recent passage of State Initiative 655 is expected to greatly reduce the number of cougars harvested annually by Washington hunters. Cougar/human conflicts are expected to increase, and WS is likely to receive more cougar complaints during the next several years. Under the current program, a relatively small number of cougars may be taken. As with the black bear, this number is expected to be only a fraction of the number that were traditionally harvested by hunters and is expected to have little impact on cougar populations. WS coordinates the take of cougars with WDFW.

Grizzly bear and gray wolf - Under Section 10 of the Endangered Species Act (16 U.S.C. 1531 et seq.), interagency contingency plans have been established for Agency response to problem wolves and grizzly bears (Idaho Department of Fish and Game, et al., 1989; FWS, 1994). Under these plans WS would work in coordination with FWS and WDFW to resolve instances of livestock depredation, destruction of property, or threats to public safety. Agency response to problem wolves and grizzly bears are intended to reduce conflicts with humans, thus contributing to the recovery of both species. Wolves and grizzly bears are rare in Washington. There were no reported instances of either species causing problems during FY 1994-1996.

Red fox - Red fox are occasional predators of domestic fowl and small livestock in limited areas of the state. Red fox can also negatively impact populations of some species of game birds. WS did not remove any red fox during FY 1994-1996. However, WS may respond to fox depredation complaints in the future, and an environmentally negligible number of red fox could be taken annually.

Bobcat - Bobcats are also an occasional predator of domestic fowl and livestock in limited areas of the state, and they may impact local populations of some wildlife prey species. WS did not remove any bobcats during FY 1994-1996. However, WS may respond to a small number of bobcat complaints in the future, and an environmentally negligible number of bobcats could be taken annually.

Badger - Badger damage in Washington may range from damage to pasture and agricultural lands to losses of property or livestock. In FY 1994-1996, WS took a total of 2 badgers in Washington, one of which was a nontarget. WS may respond to a small number of badger complaints under the current program alternative, and an environmentally negligible number of badgers could be taken annually.

Feral or Free-Ranging Dogs - During FY 1994-1996, WS took 3 dogs statewide. Two were causing damage, and one was a free-ranging, nontarget animal. WS makes every effort to avoid unintentional take of dogs. WS may respond to dog complaints in the future, and a small number of dogs may be taken.

Raven - A population analysis based on data from the U.S. Geological Survey (USGS) Biological Resources Division (BRD) Breeding Bird Survey (BBS) indicates raven populations in Washington state have been steadily increasing at an estimated rate of 2.1 per year. This trend coincides with a general nationwide increase in raven populations throughout their natural range (USGS, BRD, 1997 web site). During FY 1994-1996, WS removed a total of 90 ravens, or an average of 30 ravens/year. This take is considered minor and would not adversely affect raven populations.

3.1.2 Impact on Nontarget Species Including T&E Species

Nontarget species are species which could be affected by control activities but are not the intended target species. Nontarget species could include sensitive or protected species such as federally or state listed threatened and endangered species.

WS field representatives are skilled and experienced in the selection and application of control methods used, and take of nontarget species is low and not significant. The total number of nontarget animals taken during FY 1994-1996 as a result of WS predator control activities in Washington was 2 porcupines, 1 badger, and 1 feral/free ranging dog.

Federally listed threatened or endangered species occurring in areas where predator control is conducted (or could occur in the reasonably foreseeable future) include: bald eagle (*Haliaeetus leucocephalus*), peregrine falcon, (*Falco peregrinus anatum*), and gray wolf (*Canis lupus*). WS national program impacts on these species have been fully evaluated in the FWS (1992) Biological Opinion. WS has adopted all reasonable and prudent measures and terms and conditions identified by the FWS. In addition, WS completed a site specific informal consultation with the FWS on September 25, 1996. FWS agreed with WS's determination that the program, with its existing conservation measures, was not likely to adversely affect these species of special concern. The informal consultation and correspondence from FWS is attached in Appendix 3.

In that consultation, WS also determined that proposed activities did not occur in occupied range of the grizzly bear (*Ursus arctos horribilis*), the Columbian white-tailed deer (*Odocoileus virginianus leucurus*), or the Aleutian Canada goose (*Branta canadensis leucopareia*). WS agreed to reinitiate consultation with FWS prior to implementing control activities if requests

were received for predator control work where these species occurred. Shortly after consultation was completed, FWS requested WS assistance on the Julia Butler Hansen National Wildlife Refuge in controlling coyote predation on Columbian white-tailed deer fawns. Environmental analysis for this project was conducted by FWS, and work for the project was completed in spring 1997.

State listed threatened or endangered species which occur in areas where predator control may be conducted include the pygmy rabbit (*Brachylagus idahoensis*) and the ferruginous hawk (*Buteo regalis*). WDFW agreed with WS's assessment that program activities are not likely to impact these species. Also considered in WS's assessment were the greater sandhill crane (*Grus canadensis tabida*) and the lynx (*Lynx canadensis*). WS activities are not expected to overlap critical range of these species, and WDFW concurred that WS activities were unlikely to adversely affect either of these species. A consultation letter and correspondence from WDFW are attached in Appendix 4.

3.1.3 Impact on Public Safety

Some WS control methods may pose potential hazards to employees and the public if improperly used. However, the health risk to the public is low because WS methods are used in areas where public access is limited, or where such use poses low risk due to WS standard operating procedures. Additionally, warning signs are posted to alert the public when such devices are present. During FY 1994-1996, there were no reported injuries to WS personnel or members of the public related to WS's use of any control methods in Washington. Appendix P of the WS EIS (USDA 1994) provides a detailed risk assessment and documents the low levels of risks associated with methods used by WS personnel. This assessment includes potential risks to nontarget animals, WS employees, and the public (USDA 1994). Specimen labels for the M-44, gas cartridge, and DRC-1339 are included in Appendix 5.

3.1.4 Humaneness of Control TechniquesHumaneness is discussed and assessed in the ADC EIS (USDA 1994). The WS program on a national level has evolved toward using more selective control techniques that reduce unnecessary pain and death.

The issue of humaneness, as it relates to the killing or capturing of wildlife is an important and very complex concept that can be interpreted in a variety of ways. Humaneness is a person's perception of harm or pain inflicted on an animal, and people may perceive the humaneness of an action differently. Some individuals and groups are opposed to some of the management actions of WS.

WS personnel are experienced and professional in their use of management methods to minimize pain and suffering. WS has improved the selectivity of management devices through research and development of pan tension devices, break-away snares, tranquilizing drugs, and chemical immobilization and euthanasia procedures that reduce pain. WS strives to improve selectivity and humaneness of management devices (USDA 1996) and continues to incorporate advances into program activities.

3.1.5 Effectiveness of the WS Program

The effectiveness of the program can be defined in terms of reduced economic losses, decreased health and safety hazards, and minimized property damage. The analysis on effectiveness of the Washington program includes monetary costs of the program to the public, state, and other jurisdictions, and direct and indirect impacts, including cost of impacts on the environment. The current and expanded program alternatives were compared with the other alternatives in the ADC EIS and were concluded to be the most effective of the alternatives considered (USDA 1994).

The ADC EIS (USDA 1994) stated that "Cost effectiveness is not, nor should it be, the primary goal of the WS program". Additional constraints, such as environmental protection, land management goals, and others are considered whenever a request for assistance is received. These constraints increase the cost of the program while not necessarily increasing its effectiveness, yet they are a vital part of the WS program.

Regardless of the above constraints, the cost effectiveness of the current program is estimated to be high in Washington. In addition, costs to taxpayers are further reduced, because only about 40 of WS current program funds in Washington comes from direct State or Federal funding. The remainder of funding is provided by those who request operational assistance.

3.2 Impact of the Technical Assistance Alternative

The Technical Assistance Alternative is a modification of the Current Program Alternative wherein no direct control would be provided by WS. This Alternative would allow WS to provide technical assistance only. Some examples of this would be recommendations or training on: structural modifications such as fencing to deter predators, the use of livestock guarding animals, the electronic guard, or lethal control methods such as trapping, snaring, or shooting. Although many techniques may be applicable, the individual requesting assistance would determine which recommendations to carry out. WS would most likely be involved in providing training and recommendations to people without experience or knowledge in wildlife management. Therefore, the environmental impacts of these actions cannot be fully assessed or monitored.

Other agencies, organizations, or individuals would be free to carry out necessary lethal control work to resolve wildlife damage. Since nonlethal controls alone do not always prevent or reduce wildlife damage or threats to public health or safety to acceptable levels, other government agencies, private organizations, and individuals would likely assume responsibility for implementing lethal controls necessary to adequately deal with these problems.

3.2.1 Impact on Target Species

WS would have no significant impact on target species under this alternative. However, losses to livestock and other resources would likely increase, and relatively untrained individuals or groups may use methods that adversely affect target species.

3.2.2 Impact on Nontarget Species Including T&E Species

WS would have no impact on nontarget or T&E species. Similar to the impact on target species, this alternative would have the potential for greater adverse impacts from the actions of private individuals. Presumably, many service recipients would become frustrated with WS's failure to resolve their wildlife damage, and would turn somewhere else for assistance. Variability in the level and scope of wildlife damage control activities could occur, and this could have a greater negative impact on some wildlife species, including T&E species.

3.2.3 Impact on Public Safety

The potential for WS impacts on public safety would be decreased since lethal controls would no longer be used by WS employees. However, private individuals using unregistered toxicants or using toxicants or other methods incorrectly could have adverse impacts on public safety.

3.2.4 Humaneness of Control Techniques

Nonlethal control techniques are generally considered more humane by animal welfare groups. However, lethal actions to control predator damage taken by individuals with little or no oversight may be less humane than with a Federal program that is accountable to public input and upon which humane interest groups focus their attention. Fewer people may be aware of actions taken by individuals that require less public accountability or disclosure. Thus, the perception of inhumane activities may be reduced, although actual occurrence of those activities may increase.

Under this alternative, WS would have little effect on humaneness, beyond advice offered. Individuals would be more likely to conduct lethal controls on their own. This action would have the potential for an increase in pain and suffering to target and nontarget species.

3.2.5 Effectiveness of the WS Program

With no lethal control by WS, livestock and property losses would likely be higher than with the current program, because the full array of control techniques would not be available. In addition, nonlethal control is not always effective as a sole alternative because: 1) it does not always resolve depredation problems; 2) it is often not cost effective; 3) it often results in livestock producers and others needing to use lethal control methods which may sometimes have negative impacts on target and nontarget species; and 4) it may cause individuals to seek assistance from other entities which may not have the expertise or authority to resolve depredation problems. This alternative would not be consistent with the ADC Decision Model (USDA 1994). The effectiveness of this alternative is low.

3.3 Impact of the Nonlethal Prior to Lethal Methods Alternative

This alternative could affect WS's ability to quickly address wildlife threats and damage problems by limiting control actions to nonlethal control methods before lethal measures could be used. Continued or increased threats to livestock producers, property owners, and human safety would be likely to occur due to the restrictions placed on this management alternative.

3.3.1 Impact on Target Species

This alternative would result in little, if any, difference in the number of animals taken by WS as compared to the current program. No major adverse impacts on the species involved would be expected. Most livestock producers already practice some nonlethal control measures and oftentimes turn to WS for assistance after those methods have failed to provide adequate protection. Impacts on target species would be similar to the current program.

3.3.2 Impact on Nontarget Species Including T&E Species

Impacts on nontarget and threatened and endangered species would be similar to the current program alternative.

3.3.3 Impact on Public Safety

WS's recommendations or use of nonlethal control measures would have no adverse effect on public safety. The impact of WS's use of lethal control measures would be similar to the current program alternative (minimal impact).

3.3.4 Humaneness of Control Techniques

Nonlethal control techniques are generally considered more humane by animal welfare groups. However, lethal methods would be more likely to be used by individuals under this alternative and would be allowed for WS use if nonlethal methods were not sufficiently effective. WS's operating policies and procedures direct activities to be conducted with a major concern for the welfare of animals. Since nonlethal methods must be used first, this alternative would be less humane for livestock and other domestic animals if the nonlethal methods prove inadequate in protecting them from predators.

3.3.5 Effectiveness of the WS Program

This alternative would sometimes not allow WS to respond to wildlife threats quickly or adequately. This alternative does not support the ADC EIS and Record of Decision and ADC Directive 2.101, which addresses WS's policy for applying Integrated Wildlife Damage Management. However, components of this alternative would be preferred since lethal methods are considered only when nonlethal methods have been determined to be either ineffective, inhumane, not biologically sound, or not economically feasible. This is consistent with ADC Directive 2.101.

WS's program expertise and techniques would not be fully available from the beginning to respond to wildlife damage situations. Under this alternative, increased possibilities of wildlife damage and wildlife threats to human safety would be higher than the current program alternative.

The use of nonlethal methods first may delay effective wildlife damage management and the protection of livestock, property, and human health and safety. The current program uses or recommends nonlethal methods in instances in which they are considered likely to be effective. Imposing nonlethal methods as a first option regardless of whether they are likely to resolve a damage situation would be less effective.

3.4 Impact of the No WS Program Alternative

Under the No Program Alternative, WS would not respond to damage caused by predators. This alternative does not comply with the WS direction from Congress to provide wildlife

damage assistance. However, this alternative was considered in detail in the ADC EIS (USDA 1994) and was found to have the potential to have negative impacts on target and nontarget species, humaneness, public safety, and other resources.

3.4.1 Impact on Target Species

WS would have no impact on target species under this alternative. However, damages by predators would likely increase, and there would be an increased likelihood for untrained individuals or groups to use unsupervised or illegal methods that may have detrimental impacts on target species.

3.4.2 Impact on Nontarget Species Including T&E Species

WS would have no effect on nontarget or T&E species. Similar to the effect on target species, this alternative may lead to untrained individuals using unproven and non-selective techniques that would have an adverse impact on nontarget and T&E species.

3.4.3 Impact on Public Safety

WS would have no impact on public safety under this alternative. Negative effects on public safety may result from untrained and unlicensed individuals using toxicants and other control methods.

Table 2. A comparison of impacts of alternatives considered in detail in this EA.

Issue Analyzed	Alternative 1 Current Program	Alternative 2 Technical Assistance[1]	Alternative 3 Nonlethal Before Lethal	Alternative 4 No WS Program[2]	Alternative 5 Expanded Program
Target Species	No significant impact	Negative impact likely	No significant impact	Negative impact likely	No significant impact
Nontarget (includes T&E Species)	No significant impact	Negative impact likely	No significant impact	Negative impact likely	No significant impact
Public Safety	Little risk to public safety	Greater risk likely	Little risk to public safety	Greater risk likely	Little risk to public safety
Humaneness	Attempts to reduce	Potentially less humane	Less humane to livestock	Potentially the least	Attempts to reduce

	unnecessary suffering	than Current Program	and domestic animals	humane alternative	unnecessary suffering
Effectiveness	Less effective than Expanded Program	Much less effective than Current Program	Less effective than Current Program	Least effective	Most effective

[1]Under this alternative, WS would not have control beyond its recommendations, and improper methods and control devices would likely be implemented by inexperienced personnel.
[2]Under this alternative the potential for environmental impact would be greater, because untrained and inexperienced individuals would be likely to take independent actions to control predators.

3.4.4 Humaneness of Control Techniques

Actions taken by individuals to control predator damage may be less humane than with a Federal program that is accountable to public input and upon which humane interest groups focus their attention. Fewer people may be aware of actions taken by individuals that may be perceived as inhumane. Thus, the perception of inhumane activities may be reduced, although the actual occurrence of those activities may increase.

Under this alternative, WS would have no effect on humaneness. However, untrained individuals would be likely to conduct lethal controls on their own. This action would have the potential for an increase in pain and suffering to target and nontarget species.

3.4.5 Effectiveness of the WS Program

WS would have no program, and therefore no effectiveness. This option is not likely to be as effective at controlling the cause of the damage as any of the other alternatives.

3.5 Impact of the Expanded Program Alternative

Under an expanded program, WS would work on additional lands, and damage control activities would be increased statewide. WS conducted an expanded program in Washington during FY 1987-1993. Cutbacks in State funding in July 1993 reduced WS services to the Current Program level. The State Legislature recently approved new funding which would make the Expanded Program Alternative feasible.

3.5.1 Impact on Target Species

Coyote - Under the pre-1994 program, WS removed an average of 2,956 coyotes annually (FY 1991-1993; the three most active years). It will be assumed for this analysis that the Expanded Program Alternative discussed here would result in a similar take of coyotes. When this number is added to the 3,540 coyotes taken annually by private trappers, sport hunters, and others (see Chapter 3.1.1), the result is a total annual take of about 6,500 coyotes. Based on a conservative population estimate of 0.7 coyote/mi^2, this number represents about 14 of the statewide coyote population of approximately 46,500 animals. According to the population model discussed previously [Connolly and Longhurst (1975), Connolly (1995)], coyotes can withstand an annual removal of 70 of their numbers and still maintain a viable population . Annual removal of 14 of the coyote population in Washington would result in cumulative impacts of low magnitude.

As discussed under the Current Program Alternative, control actions may cause temporary local reductions in coyote numbers. However, coyotes immigrating from surrounding areas may repopulate areas of lower density in as little as 3 months (Henke 1992).

Black bear and cougar - A total of 5 black bears and 1 cougar were removed by WS during FY 1991-1993 under an expanded program that was similar to this alternative. However, the recent passage of State Initiative 655 banning hunters' use of hounds and bait is expected to substantially reduce hunter harvest of black bear and cougar. State and Federal agencies are anticipating an increase in bear and cougar conflicts with humans. If the number of damage incidents increases over previous years, WS may consequently remove more black bear and cougar. However, cumulative take of both species would likely be less than the current hunter harvest, and anticipated impacts on black bear and cougar populations would be minimal. WS would coordinate bear and cougar complaints with WDFW.

Grizzly bear and gray wolf - These species would continue to be managed as described under the Current Program Alternative. No negative impacts are anticipated.

Raven - WS removed a total of 291 ravens during FY 1991-1993. Two-hundred eighty-four of these were taken in 1992 during a season of unusually high raven depredations on livestock. While this take was abnormally high as compared to preceding and following years, a take of this size would not be expected to have negative impacts. Data from the BRD, Breeding Bird Survey (1997 web site) indicates raven populations have been steadily increasing in Washington at an estimated annual rate of 2.1 . Program activities under this alternative would not adversely affect raven populations.

Other target species (badger, red fox, bobcat, feral/free ranging dog) - An expanded program would not have much more impact than the Current Program and would not significantly impact other target species. A minimal number of these animals would be removed by WS.

3.5.2 Impact on Nontarget Species Including T&E Species

Under the FY 1991-1993 program, WS take of nontarget animals averaged less than 0.5 of its take of target animals (USDA-APHIS-ADC 1991, 1992, 1993). It can be assumed that there would be a similar level of nontarget take under the Expanded Program Alternative. Although the total numbers of nontarget animals taken by WS would likely increase as compared to the Current Program Alternative, there would not be significant adverse impact on nontarget species. Neither would there be adverse impact on threatened or endangered species, because all standard practices, mitigations, and coordination with other Agencies would still be in place. Cumulative impact on nontarget and threatened and endangered species would probably be reduced under this alternative, because more people would request WS assistance rather than attempting to resolve wildlife conflicts on their own with methods that may not be as selective as those used by WS.

3.5.3 Impact on Public Safety

WS impacts on public safety under an expanded program could be higher than the Current Program Alternative due to an increased potential for exposure. However, expected impacts would be minimal. Risk to the public would be low, because WS follows standard guidelines and takes specific measures to safeguard the public. In addition, most methods are used in areas where public access is limited or where such use poses low risk. WS also coordinates with land management agencies, property owners, and others on safe placement of predator control devices and toxicants. The ADC EIS (Appendix P) provides a detailed risk assessment and documents the low levels of risks associated with methods used by WS (USDA 1994).

3.5.4 Humaneness of Control Techniques

The humaneness of control techniques would not change under an expanded program. WS would continue to use selective and humane techniques. Under this alternative, it is more likely that the public would rely on WS to resolve predator problems, rather than considering the implementation of other measures which may be less humane.

3.5.5 Effectiveness of the WS Program

An expanded program would be more effective in terms of losses prevented and cost effectiveness than any of the other alternatives considered. It would provide more consistent resolution to conflicts with predators and would provide a greater level of professional assistance to people who may otherwise use methods to resolve predator problems that are less environmentally desirable.

3.6 Cumulative Impacts

Cumulative impacts are impacts on the environment that result from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions. The scope of this proposal and the number of predators that might be removed by WS under any of the alternatives would not result in significant cumulative impacts. Because of ongoing contact with state and federal wildlife management agencies, national and local knowledge of wildlife population trends, and mitigation measures used, WS does not have a significant cumulative impact on target species, nontarget species, or sensitive and protected species. This finding is also made on a national level in the ADC programmatic EIS (USDA 1994).

Cumulative impacts of public actions to control predators in the absence or reduced presence of WS can only be speculated upon. However, it is reasonable to expect that as governmental assistance in resolving wildlife conflicts decreases, independent actions increase. The environmental desirability of these actions would be dependent upon the individuals who implement them. Many such actions would be poorly monitored, and public accountability would be low. For these reasons, it is likely that cumulative impacts to the environment would increase as WS assistance decreases.

This environmental assessment will be reviewed periodically to assure conformance with current environmental regulations and project scope. Substantial changes in the project scope or changes in environmental regulations may trigger the requirement for a new or revised environmental assessment.

4.0 CONCLUSION

The implementation and application of a variety of safe and practical methods for the prevention and control of damage caused by wildlife is the most effective solution addressing the needs for action presented in this environmental assessment. Both the Current Program and Expanded Program Alternatives draw from a combination of wildlife damage management techniques that would have the least negative impact on target and nontarget species. Under these alternatives, WS could apply both lethal and nonlethal methods, separately or in combination. Nonlethal methods may incorporate habitat modification, modification of animal behavior (i.e., scaring, and the recommended use of electric fencing, exclusion devices, guarding animals, and husbandry methods), local population reduction (relocation), or any combination of these, depending on the characteristics of the specific damage problems. Wildlife damage management tools could include cage traps, culvert traps, foothold traps, snares, calling/shooting, chemical immobilizing and euthanizing agents, sodium cyanide device (M-44), gas cartridges (denning), DRC-1339, hunting dogs, and aerial shooting.

The Current Program and Expanded Program Alternatives respond to the legal mandate that WS provide wildlife damage management assistance. They use legally, environmentally, biologically, and technically sound management strategies and have the least likely potential for harmful direct and indirect impacts on the environment.

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APPENDIX 1

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APPENDIX 2

WS WILDLIFE DAMAGE MANAGEMENT METHODS

Methods That May be Recommended by WS and Applied by Livestock Producers and Others

Cultural methods include a variety of practices that can be implemented by livestock producers and others to reduce resource exposure to wildlife damage and economic loss. Use of these practices is appropriate when the potential for damage can be reduced and producer investments in labor, management, or infra structure are consistent with land management and production goals. WS recommends changes in cultural practices when a change appears to represent a practical means of minimizing or preventing future losses.

Animal Husbandry

Animal husbandry is the level of care and attention given to livestock. Husbandry methods which may reduce losses to predators include: shed lambing, night penning, and the use of herders and livestock guarding animals.

The frequency of care or attention given to livestock may range widely. Generally, as the frequency and intensity of livestock handling increases, so does the degree of protection. In operations where livestock are left relatively unattended for extended periods, the risk of predation is greater. The risk or magnitude of predation can generally be reduced when livestock owners gather and pen livestock nightly. Additionally, the risk of predation is usually greater with immature livestock and diminishes as age and size increase. Holding pregnant females in pens or sheds offers greater protection at birth, and holding newborn livestock in pens for the first two weeks may reduce vulnerability, especially from avian predators but at times, too, only delays predation.

The use of herders and livestock guarding dogs has provided protection to grazing sheep. The presence of herders accompanying sheep generally helps to deter predators, however, while herders have proven successful, some operations have not shown such promising results. Often the use of other management measures is required to provide an acceptable level of livestock protection.

Fencing

A standard woven wire livestock fence in good repair can help limit access by predators. However, such fences are not predator proof. Predator exclusion fences constructed of woven wire or multiple strands of electrified wire are effective in some areas, but this fencing also has limitations. Even an electrified fence is not always predator proof, and the expense may exceed the benefits. If large areas are fenced, predators must be removed from the enclosed area to make the fencing effective. Some fences may inadvertently trap, catch or affect the movement of nontarget wildlife. Fencing is a good first option in many situations, but it is not always practical and may not be legal in some areas (e.g., restricting access to public land).

Use of Livestock Guarding Animals

The use of livestock guarding dogs to protect livestock can be traced back many centuries to Europe and Asia, but little was recorded about how the dogs were actually used. Researchers have recently begun to answer important questions about the function of livestock guarding dogs.
Livestock guarding dogs generally stay with sheep without harming them while aggressively repelling predators. The dog chooses to remain with sheep because it has been reared from puppyhood with them. Its protective behaviors are largely instinctive; relatively little training is required other than timely correction of undesirable behaviors (e.g. chewing on ears, over playfulness, excessive wandering). The guarding dog, unlike a herding dog, becomes a full-time member of the flock.

It is important to understand the distinction between herding dogs and guarding dogs. Herding dogs (border collies, Australian shepherds, and others) move sheep from one area to another. Herding dogs work according to signals (verbal and hand) from a handler, and they are generally not left alone with sheep. Guarding dogs usually do not herd sheep, are discouraged from biting, chasing, and barking at sheep, and act independently.

The behavior displayed by a mature guarding dog is the result of heredity (genetic factors) and how the dog was raised. Livestock guarding dogs have been historically selected for their ability to act independently in their guarding role. This trait makes them more difficult to train to verbal commands than some other dogs. Some training as a pup and familiarization with the handler can help eliminate problems later when the dog matures.

The use of dogs as a predation management tool is not without problems. Dogs take 1-2 years to reach guarding maturity, and on the average only 70 become effective guardians. In addition, approximately 40 of working dogs die from accidents and other causes in their first 2 years of life. The use of guarding dogs involves a substantial investment of time, effort, and money. Dogs are not equally effective in all settings, and owners are not equally skilled in raising and training them. Some dogs cause problems such as killing or injuring livestock, roaming, or harassing and killing wildlife. Despite these considerations, dogs can reduce predation under a variety of conditions, and many sheep and goat producers have incorporated livestock guarding dogs into their operations.

Electronic Guard

A portable unit that houses a powerful strobe light and siren, known as the "Electronic Guard," was developed by the Denver Wildlife Research Center. Strobe lights, in combination with sirens, have been used with some success to avert coyote predation on sheep. The Electronic Guard should be placed on high areas and hung from a tree or post, near where predation has occurred. When possible, the guard should be placed in the center of the bed ground with other guards around the edge. The number of guards needed to protect sheep will depend on the size, terrain, and vegetation in or around the pasture. The guard can easily be transported from one location to another, and should be moved frequently to provide a novel stimulus to the offending predators. The device activates automatically at nightfall and is programmed to discharge periodically throughout the night. The technique is most successful when used at "bedding grounds," where sheep are gathered to sleep for the night. The Electronic Guard is available through WS's Pocatello Supply Depot.

Methods Applied by WS

Frightening Devices

Frightening devices are used to scare animals from damage sites. Recorded animal distress and alarm calls can be played back at intervals or continuously to frighten target species. Propane exploders and pyrotechnics produce loud explosions at controllable intervals to frighten target species.

Bright lights, flashing lights, and strobe lights sometimes are used to frighten animals that feed at night. Combinations of powerful strobe lights and sirens (electronic guard) have also been used to frighten coyotes, and avert depredation of sheep.

Harassment also can frighten predators and help to avoid wildlife damage. Human activity, dogs, boats, planes, automobiles, and all-terrain vehicles are used as harassment methods.

Foothold Traps

Foothold traps are used to capture animals such as coyotes, bobcats, fox, mink, beaver, raccoon, skunk, muskrat, nutria, wolves, and cougars. These traps are the most versatile and widely used tool available to WS for capturing many species. Traps are effectively used in both terrestrial and shallow aquatic environments.

Traps placed in the travel lanes of the target animal, using location rather than attractants, are known as "blind sets." More frequently, traps are placed as "baited" or "scented" sets. These trap sets use an attractant consisting of the animal's preferred food or some other lure such as fetid meat, urine, or musk to attract the animal into the trap.

In some situations, a carcass or large piece of meat (i.e., a draw station) may be used to attract target animals to an area where traps are set. In this approach, single or multiple trap sets are placed at least 30

feet from the draw station. WS program policy prohibits placement of traps or snares within 30 feet of a draw station to prevent the capture of nontarget scavenging birds. There are only two exceptions to this policy. One is when setting foothold traps to capture cougars returning to a kill. In these cases the weight of the target animal allows pan tension adjustments which preclude the taking of small nontarget animals. The second exception is when foothold traps are set next to carcasses to capture raptors under permit with the FWS.

Two primary advantages of the foothold trap are that they can be set under a wide variety of conditions, and that pan tension devices can be used to prevent smaller animals from springing the trap, thus allowing a degree of selectivity not available with many other methods. Effective trap placement by trained personnel greatly contributes to the foothold trap's selectivity. Another advantage of foothold traps is that the live-capture of animals permits release if warranted.

Disadvantages of using foothold traps include the difficulty of keeping them in operation during rain, snow, or freezing weather. In addition, they lack selectivity where nontarget species are of similar size to target species and are abundant. The selectivity of foothold traps is an important issue and has been shown to be a function of how they are used. The type of set and attractant used greatly influences both capture efficiency and the risk of catching nontarget animals.

The use of foothold traps in the WS program is costly due to the amount of manpower and time involved. However, the technique is indispensable in selectively resolving many animal damage situations.

Snares

Snares, made of cable, are among the oldest existing wildlife damage management tools. Snares can be used to catch most species but are most frequently used by WS to capture coyotes, cougar, bear, and beaver. They offer the advantage of being much lighter than foothold traps and are not as affected by inclement weather.

Snares are used wherever a target animal moves through a restricted lane of travel (i.e., "crawls" under fences, trails through vegetation, den entrances, etc.). When an animal moves forward into the snare loop, the noose tightens and the animal is held.

Snares can be set as either lethal or live-capture devices. Snares set to capture 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. Snares are particularly useful for the live-capture of beaver as they are easily caught around the body. Careful attention to details in placement of snares and the use of slide stops can also allow for the live-capture of neck-snared animals.

The foot or leg snare is a nonlethal device activated when an animal places its foot on the trigger of a snare throwing arm. When tripped, the spring-operated throwing arm tightens the snare around the leg and holds the animal. Foot snares are used effectively to capture grizzly bear, black bear, and cougars.

The catch pole snare is used to capture or handle problem animals. Catch poles are primarily used to remove live animals from traps without injury to the animal or danger to the WS Specialist.

Shooting

Shooting is selective for the target species but is relatively expensive due to the staff hours required. Nevertheless, shooting is an essential wildlife damage management method. Removal of one or two problem animals can quickly stop damage. Some predators such as coyotes can be called and shot. Trap-wise coyotes, while difficult to trap, are often vulnerable to this technique. Shooting is a highly selective method of control.

Aerial Shooting

Shooting from aircraft is a commonly used coyote damage management method. Aerial shooting is species-selective and can be used for an immediate remedy where livestock losses are severe, if weather, terrain, and cover conditions are favorable. Aerial shooting can be effective in removing offending coyotes that have become "trap-wise" and/or are not susceptible to calling and shooting. Local depredation problems can often be quickly resolved by the use of this technique.

Fixed-wing aircraft are useful over flat and gently rolling terrain. Helicopters have greater utility and are safer over brushy ground, timbered areas, or broken land where animals are more difficult to spot. In broken timber or deciduous ground cover, aerial shooting is more effective in winter when snow cover improves visibility or in early spring before leaves emerge. Aircraft are also used in searching for coyote dens. This method may also be used to reduce local coyote populations in lambing and calving areas with a history of coyote predation. In some states, aerial shooting is also used to improve survival of deer and antelope by reducing local coyote populations.
Good visibility is required for effective and safe aerial shooting operations; relatively clear and stable weather conditions are necessary. Summer conditions may limit effective aerial shooting as heat reduces coyote activity, and visibility is greatly hampered by vegetative ground cover. High temperatures, which reduce air density, affect low-level flight safety and may further restrict aerial shooting activities. Aerial shooting is most effective when ground support crews direct aircraft to the general location of animals which have been located by eliciting coyote howls using sirens, calls, or recorded coyote howls.

WS aircraft guidelines have been developed to assure that aerial shooting programs are conducted in a safe and environmentally sound manner, and in accordance with federal and state laws. Pilots and aircraft must be certified under established WS program procedures. Only properly trained and certified WS employees are authorized as aerial shooting crew members.

Cage and culvert traps

Cage traps are used to capture animals such as skunks and raccoons and are less frequently used to capture coyote pups, foxes, cougars, and dogs. Culvert traps are commonly used to capture bears and cougars. Cage traps are drop-door wire box traps. Culvert traps work on the same principle but are larger and constructed from culvert pipe instead of wire. Both cage and culvert traps capture the animal by mechanical closure of the entry way via the animal's actuation of a triggering device. A specially designed cage trap for cougars which consists of conventional heavy-duty metal gate panels fitted with a spring loaded door is also available. Cage and culvert traps are generally baited with food items as attractants.

Cage traps can also be used to capture crows, ravens, and magpies. Such traps capture birds that enter through holes in the roof of the trap or through one-way swinging doors. The entry holes, doors, and general configuration of the traps are designed to prevent birds from finding their way out. These traps are baited with food items as attractants.

The use of cage traps allows the release of captured nontarget animals or target animals that are to be relocated. Cage traps are frequently recommended to private individuals or used operationally by WS personnel in situations where other methods may not be as safe or effective. These devices pose minimal risk to humans, pets and nontarget animals, and are easily monitored and maintained.

Chemical immobilizing and euthanizing agents

Chemical immobilizing agents such as Telazol, Xylazine HCl, and Ketamine HCl are used most frequently to immobilize large animals such as bears and cougars. Immobilizing agents are typically administered by intramuscular injection and allow for safe and humane handling with reduced stress on the animal. Immobilizing agents are most commonly used on bears or cougars that are to be relocated, released on site, or chemically euthanized. Euthanizing agents approved for use by WS are all in the sodium pentobarbital group. Appropriate WS personnel are trained and certified in the use of chemical immobilizing and euthanizing agents.

M-44 cyanide capsule

Sodium cyanide is used in the M-44, a spring-activated ejector device which was developed specifically to kill livestock depredating coyotes. The M-44 device consists of a capsule holder which is wrapped with fur, cloth, or wool; a spring-powered ejector mechanism; a capsule containing approximately 0.9 grams of powdered sodium cyanide (plus inert ingredients); and a 5 to 7 inch hollow stake. To set an M-44, a good location is found, the hollow stake is driven into the ground, the spring ejector unit is cocked and fastened into the stake by a slip ring, and the capsule holder containing the cyanide capsule is screwed onto the ejector unit. A lure is applied to the capsule holder. A warning sign is placed within 25 feet of to warn of the device's presence.

An animal lured to the device will attempt to pick up the lure in its mouth. When the M-44 is pulled upward, the device is triggered and the spring-activated plunger propels sodium cyanide into the mouth of the animal.

M-44s are highly selective for canids because:

- The lures are selected for their attractiveness to canids.
- WS Specialists are highly selective in their choice of placement locations, targeting areas frequented by canids.
- The M-44 device releases the toxicant into the mouth only when pulled upward , and will deliver lethal amounts only if the animal's mouth is positioned directly on or over the device at the moment of ejection.

Sodium cyanide is a fast-acting toxicant which, upon contact with moisture, hydrolyzes into hydrocyanic gas and sodium hydroxide. Cyanide released into the air quickly dissipates. Cyanide which is inhaled into the lungs, kills the animal quickly leaving no harmful residue.

Hunting Dogs

Dogs are essential to successful hunting of cougar and bear. Dogs trained for coyote denning are also valuable in luring adult coyotes to be shot. Trained dogs are used primarily to locate, pursue, or decoy animals. Training and maintaining suitable dogs requires considerable skill, effort, and expense. There must be sufficient need for dogs to make the effort worthwhile.

Denning

Denning is the practice of seeking out the dens of depredating coyotes or red fox and eliminating the young, adults, or both to stop ongoing predation or prevent further depredations on livestock. The usefulness of denning as a damage management method is proven, however since locating dens is difficult and time consuming, and den usage is restricted to about 2 to 3 months of the year, its use is limited to specific, appropriate situations that must be determined by a specialist.

Coyote and red fox depredations on livestock often increase in the spring and early summer due to the increased food requirements of rearing and feeding. Removal of pups will often stop depredations even when the adults are not taken. When the adults are taken and the den site is known, the pups are killed to prevent their starvation. The pups are euthanized in the den with a registered fumigant. Denning is highly selective for the target species responsible for damage. Den hunting for adult coyotes and fox is often combined with other activities (i.e., aerial shooting, calling and shooting, etc.).

Den Fumigants

Den fumigants, also called gas cartridges, are fumigants, or gases, used to eliminate young and/or adult coyotes, red foxes, or skunks in dens. They are highly effective but are expensive and labor intensive to use. The WS program manufactures and uses gas cartridges specifically formulated for this purpose.

These cartridges are hand placed in the active den, and the entrance is tightly sealed with soil. The burning cartridge causes death from a combination of oxygen depletion and carbon monoxide poisoning.

DRC-1339

DRC-1339 is used in hard-boiled eggs and meat baits to manage crow, raven, and magpie damage for the protection of livestock and certain endangered species. DRC-1339 is only available for use under WS program supervision. When properly used, DRC-1339 is a highly selective and safe method for removing depredating crows, ravens, and magpies with little potential for primary or secondary hazards to nontarget animals. DRC-1339 is rapidly metabolized and excreted by target birds, leaving little residue.

APPENDIX 3

CONSULTATION WITH U.S. FISH AND WILDLIFE SERVICE

APPENDIX 4

CONSULTATION WITH WASHINGTON DEPARTMENT OF FISH AND WILDLIFE

APPENDIX 5

TOXICANT LABELS

APPENDIX 6

CONSULTATION WITH WASHINGTON STATE OFFICE OF ARCHAEOLOGY AND HISTORIC PRESERVATION

APPENDIX 7

LIST OF ACRONYMS

ADC	USDA-APHIS-Animal Damage Control (currently Wildlife Services)
APHIS	USDA- Animal and Plant Health Inspection Service
BBS	USGS-BRD- Breeding Bird Survey
BRD	USGS-Biological Resources Division (formerly National Biological Survey)
DOD	United States Department of Defense
EA	Environmental Assessment
EIS	Environmental Impact Statement
FAA	Federal Aviation Administration

FWS	United States Fish and Wildlife Service
FY	Fiscal Year
M-44	Sodium Cyanide Device
MIS	WS Management Information System
NASS	USDA- National Agricultural Statistics Service
NEPA	National Environmental Policy Act
T&E	Threatened and Endangered
USDA	United States Department of Agriculture
USGS	United States Geological Survey
WASS	Washington Agricultural Statistics Service
WDNR	Washington Department of Natural Resources
WDFW	Washington Department of Fish and Wildlife
WS	USDA-APHIS-Wildlife Services (formerly Animal Damage Control)