**United States Department of Agriculture**

Marketing and Regulatory Programs

Animal and Plant Health Inspection Service

Washington, DC 20250

March 3, 2008

**Submitted electronically through Regulations.gov**

Office of Pesticide Programs (OPP)
Regulatory Public Docket (7502P)
Environmental Protection Agency
1200 Pennsylvania Ave, NW
Washington, DC 20460-0001

**SUBJECT:** Docket ID Number EPA-HQ-OPP-2007-0944 (Petition Requesting EPA To Issue a Notice of Intent to Cancel the Registrations of M-44 Sodium Cyanide Capsules and Sodium Fluoroacetate

**ATTN:** Joy Schnackenbeck, SRRD (7508P)

Dear Ms. Schnackenbeck,

The U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Services program (USDA APHIS WS) appreciates the opportunity to provide comments on the petition submitted to the Environmental Protection Agency (EPA) entitled "Petition Requesting EPA to Issue a Notice of Intent to Cancel the Registration of M-44 Sodium Cyanide Capsules and Sodium Fluoroacetate" (November 16, 2007) available in docket number EPA-HQ-OPP-2007-0944. This document contains responses to the issues raised by the petitioners as well as answers to the specific questions EPA raised in its posting on January 15, 2007 (Questions for Commenter's regarding docket number EPA-HQ-OPP-2007-0944, Document ID No. EPA-HQ-OPP-2007-0944-0331, available at http://www.regulations.gov/).

The above petition was submitted to EPA by a group of petitioners, including Sinapu, Public Employees for Environmental Responsibility (PEER), Beyond Pesticides, Forest Guardians, Predator Defense, Western Wildlife Conservancy, Sierra Club, The Rewilding Institute, Animal Defense League of Arizona, and Animal Welfare Institute. The petitioners allege that M-44 Sodium Cyanide Capsules (M-44) and Sodium Fluoroacetate (Livestock Protection Collar (LPC)) pose an "imminent hazard" (as defined under the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), 7 U.S.C. §136(l)) and that the chemicals pose unreasonable adverse effects on the environment. In addition, we believe that the petitioners' request for cancellation of these products is not based on substantiated claims of misuse, unmitigated risk, or objective evidence but rather on irreconcilable philosophical differences in opinion on the use of lethal control methods to mitigate predation to livestock and damage to other resources such as endangered species. The purposes of our comments on the petition, which are included as an enclosure to this letter, are to discuss the importance of these chemicals in the integrated management programs that USDA APHIS conducts, to provide important scientific and economic information on the roles of these chemicals in our

integrated management programs, and to correct inaccuracies contained in the petition submitted to EPA.

USDA APHIS Wildlife Services (WS) is authorized by the U.S. Congress to conduct integrated management programs to reduce human/wildlife conflicts throughout the United States. APHIS WS' mission is to:

*"... provide Federal leadership in managing problems caused by wildlife. WS recognizes that wildlife is an important public resource greatly valued by the American people. By its very nature, however, wildlife is a highly dynamic and mobile resource that can damage agricultural and industrial resources, pose risks to human health and safety, and affect other natural resources. The WS program carries out the Federal responsibility for helping to solve problems that occur when human activity and wildlife are in conflict with one another*." (http://www.aphis.usda.gov/wildlife_damage/about_mission.shtml)

In the enclosed comment document, we address the following major issues:

- Background of APHIS WS and management programs
- APHIS WS program structure and predation management decision making
- Chemical use accountability, compliance, and record keeping
- Use of M-44 and LPC within the APHIS WS program
- Collaboration and consultation to evaluate impacts to wildlife
- Relationship between M-44 and LPC use and human and pet health and safety
- Economics of predation management to protect livestock
- Clarification and correction of inaccuracies in the petition

In summary, APHIS WS maintains that cancellation of M-44 sodium cyanide and sodium fluoroacetate is unwarranted. APHIS WS has used both chemicals safely and effectively, in compliance with established rules and regulations, and as part of our integrated wildlife damage management programs and goals of reducing human/wildlife conflicts throughout the United States. Cancellation of these chemicals would have significant negative consequences and would hamper our program's ability to effectively protect livestock resources.

If you have any questions about the information provided in this submission, please contact me at (202)720-2054 or by e-mail (bill.clay@aphis.usda.gov).

Sincerely,

William H. Clay
Deputy Administrator
USDA APHIS Wildlife Services

# RESPONSE TO PETITION TO CANCEL REGISTRATIONS FOR SODIUM CYANIDE AND SODIUM FLUOROACETATE

United States Department of Agriculture
Animal and Plant Health Inspection Service
Wildlife Services
1400 Independence Avenue, SW
Washington, DC 20250
March 3, 2008

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## Executive Summary

On January 24, 2007, multiple petitioners appealed to the Administrator of the Environmental Protection Agency (EPA) to cancel the registrations for sodium cyanide and sodium fluoroacetate. The U.S. Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), Wildlife Services (WS) program opposes the petition to cancel the registration of sodium cyanide and sodium fluoroacetate for predator control. APHIS WS requests that EPA deny the petition to cancel the registrations. This document provides information on APHIS WS program's use of the chemicals in support of EPA's continued registration of the products.

USDA APHIS WS is authorized by Congress to manage a program to reduce human/wildlife conflicts throughout the United States, including damage from predators. APHIS WS uses an Integrated Wildlife Damage Management (IWDM) approach which encompasses the integration and application of all approved methods of wildlife damage prevention and management to reduce wildlife damage. This includes the use of sodium cyanide capsules in the M-44 and sodium fluoroacetate (Compound 1080) in the Livestock Protection Collar (LPC).

The petition submitted to EPA for cancellation of sodium cyanide and sodium fluoroacetate was focused more on the petitioners' disagreement with the use of lethal control to address predation problems, rather than on the products' excellent environmental record. The focus of EPA's request for information related to the continued registration of sodium cyanide and sodium fluoroacetate is on the use of the materials, accountability, and partnerships to ensure that use does not cause harm to people or the environment, including threatened and endangered (T&E) species. However, it is important for APHIS WS to place its use of M-44s and LPCs in perspective within its overall mission, which is to provide federal leadership in resolving wildlife damage problems. The IWDM approach applied by APHIS WS includes the consideration of lethal and nonlethal methods, and is supported by a Decision Model to determine the appropriate wildlife damage management strategy to evaluate and respond to damage complaints (USDA 1997). This model evaluates the 1) species responsible; 2) magnitude, geographic extent, frequency, historical damage and duration of the problem; 3) status of target and non-target species; 4) environmental conditions; 5) potential biological, physical, economic, and social impacts; 6) potential legal restrictions; and 7) costs of damage management options.

During Federal Fiscal Years (FY) 1996-2006, APHIS WS used sodium cyanide in 18 states and sodium fluoroacetate in nine states, to protect livestock resources from predator damage, pursuant to three EPA pesticide product registrations. APHIS WS has always maintained pesticide records in accordance with the Federal Insecticide and Rodenticide Act (FIFRA) and EPA regulations. To better account for hazardous materials inventories, APHIS WS worked closely with the USDA Office of Inspector General (OIG) during 2001-2003 to refine the accountability process, and has implemented written procedures to fully account for the inventory of these products. APHIS WS has satisfied all issues and recommendations that were identified in the OIG audit (OIG 2004), and the audit is closed. APHIS WS uses a comprehensive inventory accounting system called "Controlled Material Inventory Tracking System" (CMITS) to aid in the tracking of products such as sodium cyanide and sodium fluoroacetate as they are received, transferred, sold, or disposed of properly. Additionally, the program uses a Management Information System (MIS) computerized database to record and track activities, product use, take of animals and other information related to program delivery.

In accordance with the National Environmental Policy Act (NEPA), APHIS WS use and potential environmental impacts of sodium cyanide and sodium fluoroacetate, have been fully analyzed in a programmatic Environmental Impact Statement (EIS) and in numerous Environmental Assessment (EA) processes. Interactions and consultations with the U.S. Fish and Wildlife Service (FWS) further assure that

APHIS WS use of sodium cyanide and sodium fluoroacetate will not adversely impact any federally listed threatened or endangered species or their critical habitat. Furthermore, APHIS WS' has concluded through its environmental analysis that cumulatively, APHIS WS IWDM activities, including the use of sodium cyanide and sodium fluoroacetate, have not adversely impacted any target or non-target species populations, including threatened and endangered (T&E) species.

APHIS WS has reviewed its pesticide use records and incident reports, and determined that the program's uses of sodium cyanide and sodium fluoroacetate do not pose a significant hazard to APHIS WS employees or the public. There have been no human fatalities associated with APHIS WS use of sodium cyanide or sodium fluoroacetate. These chemicals are mostly used in areas with limited public access and in accordance with APHIS WS Policies and Directives. While some of the materials and methods used by APHIS WS have the potential to represent a threat to health and safety if used improperly, problems associated with their misuse have rarely occurred. The majority of adverse human incidents involved APHIS WS employees as they set, maintained or removed the devices. Circumstances around public exposures were more diverse, and included intentional tampering, trespassing, accidental discharge, and human contact in association with a dog pulling an M-44. A review of incidents involving domestic dogs indicated half were preventable by the individuals responsible for the animals, only two resulted from improper use by APHIS WS personnel, and the others were classified as accidental. Only a single adverse incident was not a result of field use, but involved a rancher's dog that ingested some contaminated fleece from an LPC application, while the material was being transported for disposal.

Although humaneness is not a criterion for pesticide registration under the FIFRA, it is an important consideration for APHIS WS, and it was identified as an issue of interest to the petitioners. No EPA guidelines exist for evaluating animal distress and suffering that may be caused by EPA registered products. The assessment of humaneness of vertebrate toxicants includes consideration of several criteria, including the time that elapses until death. Cyanide is a very fast-acting chemical. Sodium cyanide capsules administered to coyotes via the M-44 resulted in the death of 67% of the study animals within 1-5 minutes (Burns et al. 1990). Sodium fluoroacetate (Compound 1080) trials of 30 ml of 1% Compound 1080 administered in LPCs resulted in the death of 6 coyotes in an average of 279 minutes (Burns et al. 1988) and 10 coyotes in an average of 295 minutes (Burns et al. 1996). The use pattern for the LPC and its target specificity reduce or nearly eliminate the risk to nontarget animals. While Compound 1080 is slower acting than cyanide, it is much faster acting than commonly used anticoagulant rodenticides (1-3 weeks, multiple feedings) such as brodifacoum, where the average time until death in common brushtail opossums was 21 days (Litten et al. 2002).

The petitioners expressed concern regarding APHIS WS use of lethal methods and the impact of lethal control on predator populations. The U.S. General Accounting Office (GAO 2001 and GAO 1990) has reviewed the APHIS WS program use of lethal methods and impacts to predators. The GAO (2001) acknowledged that economic evaluations of APHIS WS activities have been conducted by or in collaboration with APHIS WS, and that these studies were peer reviewed prior to publication in professional journals. The most comprehensive study concluded that the current APHIS WS program, which uses all practical methods (both lethal and nonlethal) of control prevention, was the most effective of the program alternatives evaluated. Regarding APHIS WS activities to reduce predation on livestock, the 2001 GAO report recognized that nonlethal control methods are usually most appropriately implemented by the livestock producers themselves, and that APHIS WS must use lethal methods in situations where nonlethal controls are ineffective, impractical, or unavailable. The 2001 GAO report concluded that for the prevention of agricultural damage, especially predation on livestock, the exact cost-benefit ratio may be incalculable, but that program costs are typically less than the benefits achieved. Additionally, the report addresses the issue that although average losses to predators may be small compared to losses from other causes, the damages are not evenly distributed over time or area. It is noted that a small proportion of producers may absorb high losses, and that these losses can have serious economic impacts. Similarly, the 1990 GAO report recognizes

that APHIS WS directs their efforts at individual offending animals or local populations of predators, and is not focused on eradication of statewide predator populations. Further, GAO (1990) asserts that WS take of predators is small compared to statewide populations and the number of predators removed by hunters and trappers. GAO (1990) concluded that APHIS WS predator management to protect livestock does not threaten predator populations in the 17 western states.

APHIS WS programs address specific wildlife damage management problems, promote tolerance toward wildlife, and reduce the likelihood of management actions taken by an unqualified public. Failure of APHIS WS to provide these scientifically sound and acceptable solutions to damage caused by wildlife may force the public to attempt solutions on their own, which may be detrimental to wildlife, the environment, and people. APHIS WS uses these products as an appropriate and accountable part of IWDM, and adheres to EPA's requirements and regulations.

## Summary Points

Sodium cyanide and sodium fluoroacetate are EPA-regulated products selective for target species.

Sodium cyanide:

- For FY 1996-2006, APHIS WS use has resulted in less than 5% nontarget take with the M-44.
- For example, APHIS WS records indicate that during FY 2006, a total of 25,993 M-44s were fired, and that 95.2% of the animals taken were target species. Further, 99.9% of all animals taken by APHIS WS in 2006 with this product were canids.
- Sodium cyanide is a fast-acting toxicant, with the majority of animals dying within 1-5 minutes.

Sodium fluoroacetate:

- For FY 1996-2006, APHIS WS use has resulted in less than 1% nontarget take with the LPC.
- During FY 2006, APHIS WS applied 2,041 LPCs, and 100% of the 47 animals taken by APHIS WS with the LPC were coyotes, the target species.
- All four of the nontarget individual animals (three bobcats and one feral dog) taken by APHIS WS use of LPCs during FY 1996-2006 were mammalian predators that attacked and killed collared sheep or goats, and thus would have been targeted by other management methods in these cases.
- For sodium fluoroacetate, animals typically die within 4.5-5 hours after exposure, and the LPCs use pattern makes it one of the most selective products available. It targets the predator in the act of biting the throat of a sheep or goat.

APHIS WS partners closely with the FWS to assess and mitigate potential impacts to threatened and endangered species.

- APHIS WS operates under Reasonable and Prudent Measures and Alternatives as identified in the 1992 Biological Opinion (BO) issued by the FWS.
- APHIS WS consults with the FWS through the Endangered Species Act Section 7 process in states where M-44s and LPCs are used, and have further restricted use where necessary to avoid or minimize risks to threatened and endangered species.

APHIS WS National Wildlife Research Center dedicates approximately 75% of its research budget to nonlethal methods development.

The United States General Accounting Office (GAO 1990) concluded that APHIS WS predator management to protect livestock does not threaten predator populations in the 17 western states. Further, the GAO (2001) recognized that nonlethal control methods are most appropriately implemented by livestock producers themselves, and that APHIS WS uses lethal methods in situations where nonlethal approaches are ineffective, impractical, or unavailable.

APHIS WS uses sodium cyanide capsules in the M-44 in 18 states and sodium fluoroacetate (Compound 1080) in the livestock protection collar (LPC) in nine states. For example, APHIS WS used M-44s and LPCs to take 12,596 and 47 coyotes, respectively, during 2006.

- The average annual amount of sodium cyanide released through APHIS WS use of M-44s was 32.66 kg, which represents an average of 0.001% of the global annual release of this chemical.
- The average annual amount of sodium fluoroacetate exposed to the environment through APHIS WS use is 0.0396 kg, which represents, for example, only 0.0016% that is used in New Zealand alone. Five other countries also use varying amounts of sodium fluoroacetate annually.

## Summary Points (continued)

APHIS WS follows EPA label instructions, Use Restrictions, and APHIS WS policy.

- APHIS WS policy requires quarterly and annual physical inventories.
    - As of 9/30/2006, APHIS WS possessed 60,670 M-44 units and 4,236 LPCs in their inventories. These data are maintained for quarterly and annual summaries.

APHIS WS use of M-44s and LPCs has resulted in only a very limited number of incidents involving people and domestic dogs.

- APHIS WS use of M-44s and LPCs has never resulted in a human fatality.
- There have been no adverse effects of human exposure to sodium fluoroacetate associated with APHIS WS use of LPCs.
- Examination of all available records for the 30-year period, 1978-2007, show that there have been 39 incidents involving sodium cyanide exposure to people from APHIS WS use of the M-44 an average exposure of 1.3 people per year.
    - 62% (24 people) were APHIS WS employees.
    - 38% (15 people) were members of the public. Six of the incidents with the public involved intentional tampering and four involved trespassing.

- For example, during FY96-FY06, the 23 incidents involving people represented only 0.007% of the number of the M-44s discharged during the 11-year period (total 325,912 M-44s discharged).

- Examination of all available records for the 41-year period 1967-2007, note that there were 41 instances of sodium cyanide exposure from M44s to nontarget domestic dogs. A total of 44 domestic dogs were involved, and 42 of them died.
    - 50% of the involved dog exposures were due to their owners' willful disregard for laws or signs.
    - 32% of the exposures were associated with other cases of unaccompanied, free-roaming dogs.

To date, there have been two incidents involving exposures of domestic dogs to sodium fluoroacetate. One involved a feral dog during active LPC application in the field setting, and one involved a rancher's dog that found contaminated fleece in a WS vehicle during an LPC application at the ranch.

APHIS WS has worked with the USDA Office of the Inspector General (OIG) to refine and strengthen hazardous materials management.

- All OIG 2004 Audit Report recommendations regarding hazardous materials management have been implemented, primarily through policy improvements and development of revised directives to refine the inventory and reconciliation processes, and the audit is officially closed.
    - WS Directives pertaining to Pesticides and Hazardous Materials were strengthened.
    - WS' CMITS provides robust accountability and reconciliation procedures adhered to by all personnel.

## Summary Points (continued)

APHIS WS predation damage management program is economical.

- The annual cost of the livestock protection program conducted by APHIS WS to manage mammal predation nationwide is approximately $20 million.
- The APHIS WS national program cost is less than 2% of the estimated cost of a national nonlethal replacement program that was proposed by the petitioners.
    - Analysis of economic issues associated with a nonlethal predator damage management program conducted in Marin County, CA, indicates that projected costs for a similar program implemented nationwide would exceed $1 billion dollars.

- Predation management for agricultural resource protection was reported to have cost:benefit ratios ranging from 1:3 to 1:27 for 13 western states (Bodenchuk et al. 2002).

- APHIS WS assistance to protect sheep in 16 western states provides benefits that are 2.4 times the cost of providing the program (USDA 1997).

## BACKGROUND

The mission of the U.S. Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), Wildlife Services program (WS) is to provide federal leadership in managing problems caused by wildlife. Congress recognized the need to reduce these problems and provided statutory authorities to the APHIS WS program under the Act of March 2, 1931 (46 Stat. 1468; 7 United States Code (USC) 426-426b) as amended, and the Act of December 22, 1987 (101 Stat. 1329-331, 7 USC 426c). APHIS WS applies the Integrated Wildlife Damage Management (IWDM, abbreviations and acronyms mentioned in text are contained in Appendix 2) approach to address challenges and problems associated with wildlife, and implements programs through professional partnerships and collaboration among federal and state agencies, institutions, agricultural and livestock producer associations, and the public. IWDM encompasses the integration and application of approved methods for wildlife damage prevention and management. The approach may incorporate cultural practices, habitat modification, animal behavior management, local population reduction, or a combination of these approaches. In applying IWDM on both public and private lands, APHIS WS offers technical assistance recommendations or may directly provide damage management solutions through operational activities. APHIS WS often provides both technical and operational assistance, consisting of a combination of nonlethal and lethal methods, to protect agricultural and other resources. Efforts to reduce predation on livestock typically include methods employed by the rancher (fencing, animal husbandry practices, harassment, habitat modifications, and lethal control) and methods applied by APHIS WS. APHIS WS direct management activities complement the methods employed by the landowner, and often include specialized methods that require professional expertise and specific training, certifications, and authorities.

APHIS WS use of sodium cyanide capsules in the M-44 device (M-44) and sodium fluoroacetate (Compound 1080) used in the Livestock Protection Collar (LPC) is an important and legitimate part of PDM conducted by APHIS WS in many parts of the country. APHIS WS recognizes the value that the public places on wildlife resources and has professional responsibilities to conserve wildlife in achieving its mission. APHIS WS use of M-44s and LPCs is conducted according to label instructions, use restrictions, pesticide applicator training and certification requirements, state permits or other authorities to take wildlife, and landowner agreements. These activities are supported by Memoranda of Understanding (MOU) among federal and state agencies, environmental impact reviews pursuant to the NEPA, and ongoing conferences and consultations with the FWS to ensure program compatibility with the Endangered Species Act (ESA). Internally, APHIS WS activities are directed by policies that require adherence to professional standards that include application of IWDM, compliance with state and federal laws, and accountability for wildlife taken and methods employed. APHIS WS accountability and oversight of pesticides includes use of the computer-based Controlled Materials Inventory Tracking System (CMITS) to track inventories, including acquisition, transfers, and disposal of materials such as the M-44 and LPC. APHIS WS has worked closely with the OIG to refine the accountability process and has implemented management directives that ensure compliance through quarterly and annual inventories and reporting. Additionally, APHIS WS' Management Information System (MIS) is a computerized database system used to record and track pesticide application, animals taken, and other activities.

The M-44 is registered for use on coyotes (scientific names of all wildlife species mentioned in this document are contained in Appendix 3), red fox, gray fox, and feral dogs under the EPA Registration No. 56228-15 and various state registrations (Appendix 4). The M-44 is also registered for arctic fox under EPA Registration No. 56228-32 and an Alaska state registration (Appendix 4). M-44 Use Restrictions are contained in Appendix 5. The LPC is registered for use on coyotes under EPA Registration No. 56228-22 and various state registrations (Appendix 6).

APHIS WS uses M-44s and LPCs according to labeling, and state and federal authorities, and tracks their use and inventory through consistently applied procedures. From FY96 (10/1/95 – 9/30/96) through FY06 (10/1/05-9/30/06), WS used M-44s in 18 states and LPCs in nine states. Photographs of the M-44 and LPC are included in Appendices 7 and 8, respectively. Detailed use and inventory information is available to APHIS WS in its MIS and CMITS systems. For example, during FY06, a total of 25,993 M-44s were fired in the field in 16 states to take 13,341 target animals: 12,596 coyotes, 320 red fox, 376 gray fox, and 49 feral dogs. The CMITS records document the national inventory of 60,670 M-44 capsules and 4,236 LPCs on hand at the close of FY06 (9/30/06). Tables 3, 4, and 6 report use and take data for APHIS WS application of M-44s and LPCs for each year during the 11-year period, FY96-FY06.

On January 24, 2007, the EPA Administrator received a petition to cancel the registrations for the M-44 and LPC from Sinapu, Public Employees for Environmental Responsibility, Beyond Pesticides, Forest Guardians, Predator Defense, Western Wildlife Conservancy, Sierra Club, The Rewilding Institute, Animal Defense League of Arizona, and Animal Welfare Institute (petitioners). The petitioners claim that cancellation and suspension of these pesticides is warranted because the use of the M-44 and LPC cause unreasonable adverse effects and pose imminent hazards. APHIS WS does not agree with this claim and asserts that many of the petitioners' issues are based on inaccurate or erroneous statements and misinterpretations of APHIS WS information. Further, the petitioners' claim regarding appropriateness of lethal take of predators in general is not necessarily related to EPA registration of pesticide products, but rather overall opposition to integrated predation management programs that include lethal take.

Similarly, three other countries have recently reviewed their Compound 1080 pesticide products. Canada published their re-evaluation decision (RRD2005-05) on April 19, 2005, and New Zealand completed a reassessment (application no. HRE05002) in April 2007. Both countries determined to continue the authorization of these products. Australia published preliminary findings of their Compound 1080 review (Australian Pesticides and Veterinary Medicines Authority 2005). The determination by Australian regulatory authorities was that with certain improvements, the regulatory agency can be satisfied that the continued use of Compound 1080 is safe for use.

This comment document will provide support for EPA's continued registration of the M-44 and LPC by providing information on APHIS WS Program operations and on the M-44 and LPC products information, organized as follows:



# 1.0 USDA APHIS WS Program Operations

## 1.1 Program Structure and Predation Management Decision-Making

The USDA APHIS WS program structure includes headquarters offices in Washington, D.C., Regional Offices in North Carolina and Colorado, 42 State Offices, 82 District and Field Offices (including six states and one territory), the National Wildlife Research Center (NWRC) in Colorado, and eight Research Field

Stations. Program delivery occurs primarily through the regional, state, and district offices, and research is conducted by NWRC. The National Wildlife Research Center is the only research facility in the world that is dedicated solely to research on methods to alleviate wildlife damage and about 75% of its total research funding has been directed toward nonlethal methods development. APHIS WS conducts its operational activities in response to requests for assistance. APHIS WS applies IWDM to address challenges and problems associated with wildlife through professional partnerships and collaboration among federal and state agencies, institutions, agricultural producer and livestock associations, and the public. Integrated Wildlife Damage Management encompasses the integration and application of many approved methods for wildlife damage prevention and management. Slate et al. (1992) and USDA (1997) describe the procedures used by APHIS WS personnel to determine management strategies or methods applied to specific damage problems. APHIS WS personnel are frequently contacted only after requesters have tried nonlethal techniques and found them to be inadequate for reducing damage to acceptable levels. APHIS WS personnel evaluate the appropriateness of strategies, and methods are evaluated for their availability (legal and administrative) and suitability based on biological, economic, and social considerations. Following this evaluation, the methods deemed practical for a situation are formed into a management strategy. USDA (1997) provides detailed examples of how the APHIS WS Decision Model is implemented for coyote predation to sheep on public and private lands.

APHIS WS recognizes that the decision to implement lethal predator damage reduction activities is a serious professional responsibility. Treves and Naughton-Treves (2005) state that lethal control can foster the coexistence between people and wildlife, and has a legitimate role in wildlife management, but that lethal control must be undertaken with care. Further, those predation management methods to be used must be considered carefully, and most often should be implemented by a government agency. The authors go on to describe a decision-making process for determining the methods and approach (lethal or nonlethal) that the applicator should consider in conducting wildlife damage management, which is almost identical to the Decision Model (Slate et al. 1992) used by APHIS WS personnel.

The APHIS WS Decision Model (Slate et al. 1992) is used by program personnel to determine the appropriate damage management method(s) to implement based on several factors: 1) species responsible, 2) magnitude, geographic extent, frequency, historical damage and duration of the problem, 3) status of target and non-target species, 4) environmental conditions, 5) potential biological, physical, economic, and social impacts, 6) potential legal restrictions, and 7) costs of damage management options[1]. APHIS WS personnel consider the costs associated with implementing a particular method, but also consider other factors based on social and professional values (selectivity and humaneness), legal factors, the species involved, location, and so on. The goal of the APHIS WS program is not necessarily to conduct a program that is as inexpensive as possible, but rather to conduct a biologically sound, environmentally safe, accountable, and responsive program.

Operational PDM activities are conducted pursuant to agreements with landowners, permits or other necessary authorities, and within guidelines established around APHIS WS Policies and Directives. Landowners who request assistance from APHIS WS typically provide APHIS WS representatives with very specific information, not only about the property boundaries of their own land, but about the boundaries of adjacent lands as well. APHIS WS acknowledges that potential for trespass exists, but does not expect that inadvertent trespass incidents will rise to the level of presenting any significant environmental effects.

APHIS WS operates to assist individuals in preventing losses from predators where and when a need exists. In the absence of a professional program, or where restrictions prohibit the delivery of an effective program, it is most likely that predator management would be conducted by private individuals and others. Privately-

1 The cost of damage management may sometimes be a secondary concern because of environmental and legal, public health and safety, animal welfare or other considerations.

conducted activities are less likely to be as selective for target species and less likely to be accountable as would be a public agency (Treves and Naughton-Treves 2005). Additionally, private activities may include the use of inappropriate or illegal methods to control predators, as the petitioners recognize. For example, in 1989 (well after the ban on Compound 1080), the petitioners noted that,"*They [the Wyoming Department of Agriculture] sold 1080 to private individuals who used it to poison wildlife…*" and in 2001, about 30 pets were poisoned in Grand Junction, Colorado, but *"… police and federal investigators were never able to apprehend the culprit who ultimately dumped the poison in the local sewer system…"* . Similarly, great-tailed grackles were illegally poisoned in Texas with dicrotophos (Mitchell et al. 1984) and a corporation in Kentucky was fined for illegally using carbofuran to destroy unwanted predators, including raptors, at a private hunting club (Porter 2004). Also, on a Georgia quail plantation, migratory birds and threatened and endangered species were killed by eggs that had been injected with carbofuran (Federal Wildlife Officer 2000). In Oklahoma, federal agents charged 31 individuals with illegally trapping and killing hawks and owls to protect fighting chickens (FWS 2003). The Texas Department of Agriculture (2006) has a website and brochure devoted solely to preventing pesticide misuse in controlling agricultural pests. The illegal or unwise use of chemicals is not just a problem in the United States. In Europe, the Britain Department for Environment, Food and Rural Affairs (2004) has a campaign against illegally poisoning animals. These incidents suggest that people will resort to whatever means are available to them to resolve conflicts with wildlife when they have resources being damaged. Therefore, APHIS WS believes that it is in the best interest of the public, pets, and the environment that a program that includes the use of predacides, be available and accountable to the public to resolve conflicts with predators. This reduces the likelihood that private resource owners may attempt to conduct their own control activities which potentially could include inappropriate or illegal methods that have unacceptable environmental impact risks. APHIS WS believes that more incidents like these could occur without professional assistance available to resolve wildlife conflicts, and without the use of the M-44 and LPC.

**Integrated Wildlife Damage Management (IWDM)**

A wide range of methods are used by APHIS WS personnel in predator damage management (PDM), and strategies are based on applied IWDM principles. APHIS WS employs or recommends three general strategies to reduce wildlife damage: resource management, physical exclusion, and wildlife management. Technical assistance may include providing advice, information, recommendations, and materials to others for their use in resolving wildlife-caused damage. Assistance is most often provided for use of predation management methods associated with resource management and physical exclusion PDM methods, and potentially a few wildlife management techniques such as harassment and cage traps. APHIS WS operational damage management efforts can include any of the predation management methods, but primarily involve site-specific, hands-on wildlife management techniques that are difficult for much of the public to implement or that involve safety concerns when being implemented by the public. APHIS WS often tells livestock and other resource owners about methods that they can implement themselves, but often many of these methods are already in use (Table 1). APHIS WS often implements the more difficult and technical methods such as M-44s and LPCs. This important feature of the APHIS WS program, whereby livestock producers typically implement habitat management, exclusion, animal husbandry and other nonlethal methods and APHIS WS typically applies more specialized lethal methods, is recognized by the GAO (2001, 1990), and demonstrated in Tables 1 and 2. Recommendations and instructions for nonlethal methods are usually provided by APHIS WS, and incorporated into the overall integrated management program. The petitioners claim that APHIS WS does not use nonlethal methods, but, as discussed, the livestock producers have often already implemented these or would be responsible for implementation of these. APHIS WS NWRC spends 75% of their budget on nonlethal technique development. In general, nonlethal methods are the methods of first resort and already in use by producers before APHIS WS assistance is requested (due to the nonlethal techniques being insufficiently effective). However, some more complicated methods, including devices such as the Radio Activated Guard and fladry are used by APHIS WS specialists.

Technical Assistance includes demonstrations on the proper use of some management devices and information on animal husbandry, wildlife habits, habitat management, animal behavior modification, and in some cases, lethal management. 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-term and long-term solutions to damage problems. These strategies are based on the level of risk, need, and practical application.

Operational Damage Management Assistance is implemented when the problem cannot be resolved through technical assistance, and consists of management actions that are preventative and corrective. APHIS WS operational damage management efforts can include any of the PDM methods, but primarily involve site-specific, hands-on wildlife management techniques that are difficult for much of the public to implement, including such methods as applications of M-44s and LPCs.

Table 1. Nonlethal methods used by cattle ranchers (NASS 2005) and sheep producers (NASS 2006) to protect their livestock from predators in 2005 and 2004, respectively. (Multiple methods may be used and percentages do not add up to 100)

| Method | % Cattle Producers | % Sheep Producers |
|---|---|---|
| Carcass Removal | 16.5 | 11.7 |
| Change Bedding | - | 8.9 |
| Culling | 13.8 | 19.6 |
| Fencing | 34.0 | 52.5 |
| Frequent Checks | 21.8 | 14.0 |
| Frightening Devices | 2.2 | 3.0 |
| Guard Animals | 38.0 | - |
| Guard burro | - | 9.9 |
| Guard dog | - | 31.8 |
| Guard llama | - | 14.0 |
| Herding | 5.7 | 3.8 |
| Night penning | 32.9 | 9.7 |
| Shed Lambing | - | 30.8 |
| Other Method | 6.2 | 3.8 |

Preventive Damage Management is applying management strategies before damage occurs, based on historical problems and data. Most nonlethal methodologies, whether applied by APHIS WS or resource owners, are employed to prevent damage from occurring. For example, fencing is often used to keep wildlife such as predators out of livestock pastures and prevent damage from occurring. Unfortunately, many nonlethal techniques are only effective for a short time before wildlife habituate to them (Pfeifer and Goos 1982, Conover 1982) and are generally only practical for small areas (Arhart 1972, Rossbach 1975, Shirota et al. 1983, Schmidt and Johnson 1984, Mott 1985, Dolbeer et al. 1986, Graves and Andelt 1987, Tobin et al. 1988, Bomford 1990). When requested, APHIS 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 historically, APHIS WS may provide information about livestock guarding animals, fencing or other husbandry techniques, or if requested and appropriate, conduct PDM before lambing or calving begins. By reducing the number coyotes near a herd of sheep or before sheep begin grazing in an area (Wagner 1997), the likelihood of damage can be reduced.

Corrective Damage Management is applying PDM to stop or reduce current losses. As requested and appropriate, APHIS WS personnel provide information, conduct demonstrations, or take action to prevent additional losses. 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 1990) concluded that, according to available research, localized lethal damage management is effective in reducing predator damage.

**Methods Available for Use**

All methods are given consideration in the decision-making process. The methods used in PDM fall under three categories, resource management, physical exclusion and wildlife management.

Resource Management includes a variety of practices that may be used by agriculture producers and other resource owners to reduce their exposure to predator losses. Resource management techniques are usually not conducted operationally by APHIS WS, but usually implemented by producers, and can be very effective (Knowlton et al. 1999, Conover 2002, Mitchell et al. 2004). Resource management techniques include habitat management, animal husbandry techniques (e.g., use of herders, night penning, and shifting breeding schedule), guard animals, and modification of human behavior (e.g., eliminate wildlife feeding and handling, and calm irrational fears of predators attacking people)

Physical Exclusion methods restrict the access of wildlife to resources. These methods can provide effective prevention of wildlife damage in many situations. Physical exclusion methods, though, can restrict animal travel for many species of wildlife and must be considered carefully. Physical exclusion methods include "predator-proof" fencing and netting. These can be effective for long-term management in particular situations and are mostly implemented by producers.

Wildlife Management techniques are varied, and the objective of this approach is to alter the behavior of or repel the target species, remove specific individuals from the population, reduce or suppress local population densities, or extirpate exotic species populations in order to eliminate or reduce the potential for loss or damage to resources. Wildlife management techniques to reduce predation include frightening devices (e.g., the Electronic Guard, propane cannons, pyrotechnics, harassment shooting, auditory stimuli such as people talking and barking dogs, bright lights, and strobe lights), and capture and take or relocation methods (trapping, snaring, shooting, the use of chemical pesticides such as the M-44, LPC, and gas cartridge, and the use of chemical immobilization and euthanasia drugs).

**Nonlethal Methods Use and Effectiveness**

Nonlethal damage management methods are important parts of integrated approaches implemented by APHIS WS to protect livestock and other resources from predation. Most nonlethal control methods such as fencing, guard animals, and animal husbandry practices are most appropriately implemented by the livestock producers themselves, with technical assistance from APHIS WS. Typically, when producers request assistance from APHIS WS, they have already begun implementing nonlethal methods, and have been unable to reduce damage to an acceptable level. Nonlethal methods are included in nearly every management program conducted by APHIS WS.

Sheep and cattle producers frequently implement nonlethal methods to reduce predator losses. National Agricultural Statistics Service (NASS) surveys estimated that sheep producers spent $9.8 million in 2004 (NASS 2005) and cattle producers spent $199.1 million in 2005 (NASS 2006) on nonlethal methods to protect their livestock from predators. The most common methods included fencing, guard animals, night penning, and shed lambing (Table 1). APHIS WS has found that many producers are using nonlethal methods prior to requesting assistance, but these have not sufficiently reduced predation problems. Nebraska WS conducted surveys in 1994 to determine the number of producers using different nonlethal methods and found that most livestock producers were using one or more methods to reduce predator losses (Table 2).

GAO (2001) reported that "*Although nonlethal methods sometimes suffice, in other instances they do not effectively deter predators or may only postpone predation*" and that in some instances, "*nonlethal methods also pose problems*," such as habituation, costliness, and low or short-lived effectiveness. APHIS WS routinely recommends a variety of nonlethal methods to protect livestock, and recognizes the applicability and limitations of these techniques. Use of livestock guarding dogs by sheep producers has been proven effective in preventing at least some predation losses (Green 1987). Use of guard dogs is generally perceived as a selective form of nonlethal predator management, although guard dogs may also cause 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 APHIS WS personnel and livestock producers suggests 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 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. Fencing of livestock pastures may inhibit big game movement, resulting in restricted migration and possibly death through starvation. Increased husbandry practices may temporarily decrease livestock depredations, but could increase anxiety in the livestock, resulting in lower birth rates and increased abandonment of young, which then starve. Some newly developed methods, including devices such as the Radio Activated Guard and fladry are currently being used by APHIS WS. Concerning training collars, APHIS WS is not using these devices operationally, since a design that is applicable for field use has not been developed.

Table 2. Nonlethal methods used by cattle, sheep, and goat producers in Nebraska having Cooperative Agreements with Nebraska WS. Multiple methods may be used and do not necessarily add up to 100%.

| Method | Cattle Producers | | Sheep Producers | | Goat Producers | |
|---|---|---|---|---|---|---|
| | Number | Percent | Number | Percent | Number | Percent |
| Carcass removal | 256 | 80.5 | 67 | 88.1 | 5 | 55.5 |
| Fencing, conventional | 259 | 81.4 | 68 | 89.5 | 7 | 77.8 |
| Fencing, electric | 92 | 28.9 | 32 | 42.1 | 3 | 33.3 |
| Confinement | 63 | 19.8 | 48 | 63.1 | 2 | 22.2 |
| Night penning | 137 | 43.1 | 66 | 86.8 | 5 | 55.5 |
| Husbandry | 229 | 72.0 | 59 | 77.6 | 5 | 55.5 |
| Herding | 133 | 41.8 | 41 | 53.9 | 2 | 22.2 |
| Guard burro | 6 | 1.9 | 3 | 3.9 | 0 | 0 |
| Guard dog | 149 | 46.8 | 43 | 56.6 | 4 | 44.4 |
| Guard llama | 2 | 0.6 | 2 | 2.6 | 1 | 11.1 |
| Habitat manipulation | 169 | 53.1 | 33 | 43.4 | 3 | 33.3 |
| Harassment, electronic | 85 | 26.7 | 30 | 39.5 | 2 | 22.2 |
| Harassment, guns | 195 | 61.3 | 53 | 69.7 | 1 | 11.1 |
| Harassment, vehicle | 212 | 66.7 | 54 | 71.0 | 2 | 22.2 |
| Exploders, gas | 0 | 0 | 5 | 6.6 | 0 | 0 |
| Lights, all types | 118 | 37.1 | 47 | 61.8 | 4 | 44.4 |
| Flags, all types | 16 | 5.0 | 8 | 10.5 | 1 | 11.1 |
| Radios | 18 | 5.7 | 17 | 22.4 | 3 | 33.3 |
| Scarecrows, all | 4 | 1.2 | 2 | 2.6 | 1 | 11.1 |

**Cost of APHIS WS Program Relative to a Proposed Nonlethal Plan**

The concept of replacing an IWDM program with one that is entirely nonlethal was presented as a preferred approach by the petitioners. In Marin County, California, a Nonlethal Plan to address predation on sheep was initiated in October 2000, and replaced the APHIS WS program that had previously occurred there. The County-administered Plan consisted of two parts: 1) cost share funds for ranch facilities improvements and nonlethal predator control methods use and 2) indemnification payments for predator-caused losses of sheep. Marin County recognized 29 commercial sheep ranchers with 7,500 head of sheep in the original program. Not every livestock producer in the county participated. Data for this nonlethal/indemnity payment program were provided to APHIS WS from the Marin County Commissioner's Office for two fiscal years, FY01 and FY02. Marin County program information and more recent livestock production and market data, were used

to extrapolate values and estimate the cost of a national "replacement program" that would contain indemnity payments, facilities improvements, and nonlethal methods use, but did not contain use of M-44s, LPCs or any other lethal method.

The cost of a national replacement program as proposed by the petitioners was estimated, using predation trends, indemnification, participation, production, and reimbursements from two years of the Marin County Nonlethal Plan. In computing national projections, calving data were obtained from NASS (2007). Sixty-nine percent (69%) of commercial ranchers in Marin County (20 of 29) participated in the Nonlethal Plan (Appendix 9). Market prices paid for depredated sheep were $70/head in Year 1 and $82/head in Year 2 (Appendix 9). Predation rates for the years provided increased from 1.5% in Year 1 to 3.2 % in Year 2 using a hypothetical lamb crop of 1.5 lambs/1 ewe (Appendix 9). For livestock protection, the empirical participation rate of ranchers, annual predation rates, annual cost share of facilities improvement payments, and indemnity payments associated with the Marin County Ranch Improvement/Nonlethal Control and Indemnity Plan were extrapolated to the 48 contiguous states. National predation rates for sheep have been reported as 4%, and, therefore, these rates were also included for comparison (Jones 2004, Bodenchuk et al. 2002). Since cattle predation was not part of the Marin County Plan, rates of cattle predation were arbitrarily set at 1.0% and 1.5% (Shwiff et al. 2006) and combined with hypothetical indemnity payments that would be required for the United States to also provide protection for range beef cattle. Goats were not included in the analyses reported here, although they are currently protected using M-44s and LPCs. Projections of first and second year costs to conduct nonlethal predation damage management programs nationwide, similar to the one conducted in Marin County, California, were developed for the protection of several categories of livestock. Data tables are contained in Appendix 9, and discussion is provided here.

Sheep. Nationally, it would cost an estimated $37,405,952 in Year 1 (predation rate of 1.5%) and $51,278,787 in Year 2 (predation rate of 3.2%) for a sheep protection replacement program. However, since a predation rate of 4% for sheep is more commonly experienced by livestock producers elsewhere in the nation, program costs were also calculated for that rate: $48,608,534 in Year 1, and $56,207,970 in Year 2 (Table C; Appendix 9).

Beef Cattle. Beef cattle are also protected with M-44s, but not directly protected with LPCs. Indemnity was based on a market value for cattle of $425 per head with predation rates of 1.0% and 1.5% for Years 1 and 2, respectively. It would cost an estimated $262,542,906 in Year 1 and $344,301,480 in Year 2 for a beef cattle protection replacement program nationwide (Table D; Appendix 9).

Sheep and Beef Cattle. The total cost of a national livestock protection replacement program annually was determined at two different levels of predation for sheep and cattle. In Year 1, at a 1.5% level of predation on sheep and a 1.0% level of predation on beef cattle, it would cost an estimated $300 million for a sheep and beef cattle protection replacement program nationwide. In Year 2, at a 3.2% level of predation for sheep and a 1.5% level of predation for beef cattle, costs would rise to over $400 million annually (Table E; Appendix 9).

**Replacement Program Cost Compared to APHIS WS Program Cost**

The annual cost of the livestock protection program conducted by APHIS WS to manage mammal predation nationwide is estimated at less than $20 million in Federal and Cooperative funds in FY06. Thus, the APHIS WS program cost is between 5% and 10% of the estimated cost of a replacement program ($300 to $400 million). Additionally, the replacement program could include higher levels of the misuse of pesticides and other lethal methods by nonprofessionals and would likely not reduce predation on livestock to acceptable levels.

Additional economic issues related to M-44 and LPC use are discussed in Section 3.0.

## 1.2 APHIS WS Accountability, Compliance and Record-Keeping

### APHIS WS National Safety Review

APHIS WS is conducting a National Safety Review of its operational programs related to aerial operations, explosives, pyrotechnics, firearms, hazardous materials, immobilization drugs, euthanasia drugs, pesticides, vehicles, ATV's, watercraft, and handling potentially diseased animals. Independent contractors have been retained to conduct thorough reviews of APHIS WS pesticide and hazardous materials operations and training programs. The purpose of the review is to ensure the safety of program employees and the public, and to seek and implement recommendations for program-wide improvement. Field visits and inspections are currently underway and a final report will be developed in FY08. For the pesticide component, the independent reviewing organization will conduct meetings and site visits with four APHIS WS state programs and will review management controls and procedures employed by these programs. For the Hazardous Materials component, the independent reviewing organization will conduct site visits at the APHIS WS Pocatello Supply Depot (Pocatello, Idaho) and NWRC (Fort Collins, Colorado).

### Office of the Inspector General (OIG) Audit

APHIS WS has worked closely with USDA OIG and the USDA Office of the Chief Financial Officer (OCFO) regarding hazardous materials inventory and accountability as a result of a 2001 OIG Management Alert. The audit included eight recommendations pertaining to accountability of pesticides and controlled drugs, four recommendations pertaining to storage and security of hazardous materials, and one recommendation pertaining to inspections of materials inventories (OIG 2004). As of April 2007, APHIS WS has obtained closure of all the audit recommendations through strengthened management controls and improvements in the program's inventory process. APHIS WS has implemented a comprehensive inventory accounting system called Control Materials Inventory Tracking System (CMITS) for hazardous materials and controlled drugs that APHIS WS uses in wildlife damage management (details below), and has updated and strengthened its management Directives (described below) pertaining to pesticides and hazardous materials. APHIS WS's hazardous materials management system is rigorous and responsive to program needs, and is accountable to OIG, APHIS, WS, and other government-wide policies and requirements.

### APHIS WS Hazardous Materials and Pesticide Use Policy

Management controls are in place for accountability of inventories of hazardous pesticides and controlled drugs. Directives regarding the use of pesticides and controlled substances have been revised or issued where needed to provide direction in achieving this objective.

APHIS WS Directive 2.465 (1/2/08), "Accountability and Oversight of Hazardous Materials," directs the review of inventories by various levels of management, including State, Regional, and Headquarters personnel. All APHIS WS users of hazardous materials must conduct and reconcile the quarterly physical inventory. Also, at least one annual physical inventory inspection is conducted by the hazardous material user and one reviewing official. Policy directs use of the CMITS system to document acquisition, transfer, and disposal of materials, and for reconciliation of perpetual inventories within all states. Annual inventories are required and annual transaction summary reports for all inventoried products are generated for submission to APHIS WS regional and national offices. The CMITS inventory process includes accounting for all Wildlife Specialist, District, and State Office inventories. The APHIS WS CMITS User Guide provides written procedures for the inventory for all pesticides and drugs. This system allows APHIS WS the ability to fully account for the inventory of these products. All inventories are reviewed by the

immediate supervisor or designated official within 14 days of receipt of the inventory. Discrepancies are corrected and accounted for by the party responsible for the storage location within 30 days. The APHIS WS State Director is ultimately responsible to ensure that all discrepancies have been corrected. The Regional Director (or designated official) ensures that all inventories within the region are accurate. APHIS WS policy (Directive 2.465) requires annual development of product inventory reports that correspond to inventories, and identify the amounts of pesticide products on hand in every state. For example, FY06 year-end reports indicated that APHIS WS nationwide possessed 60,670 M-44 capsules and 4,236 LPCs. In addition to annual reporting, each program conducts and reconciles quarterly physical inventories of its pesticides.

APHIS WS Directive 2.401 (1/2/08), "Pesticide Use", provides guidelines for storage, disposal, recordkeeping requirements, and the safe and effective use of pesticides in the APHIS WS program. The Directive's attachment, "Standard for Storing Pesticides", provides standards for the safe storage, transportation, and disposal of pesticides to ensure a safe worksite for employees and the public and to appropriately define a pesticide inventory and its contents. APHIS WS activities must be in compliance with all federal, state, and local laws and regulations pertaining to pesticide applications, including certification requirements before using, transporting, shipping, disposing, supervising, or recommending the use of restricted use pesticides.

Pesticide use, storage, and disposal conforms to label instructions and other applicable regulations and laws. Before using any pesticide, WS personnel are trained in its proper and safe use. Material Safety Data Sheets (MSDS) and labels for each pesticide used by APHIS WS are provided to all APHIS WS personnel.

Inspections are conducted for sites which store hazardous materials using the APHIS Safety Inspection Checklist (APHIS Form 256-5). These inspections are required a minimum of twice annually at all central storage/distribution facilities which store these products. Also, there is a self-inspection checklist which is utilized for vehicle storage and residential sites (two/year minimum). The APHIS WS State Director/Field Station Leader verifies the accuracy of the self-inspection checklists and APHIS Safety Inspection Checklists (APHIS Form 256-5) and takes appropriate action to correct deficiencies.

In FY02 and FY03, APHIS WS received a Homeland Security supplemental appropriation and expended $1,652,351 to upgrade the storage and security of hazardous materials. This funding was used for improvements to and acquisition of locking storage sheds or containers at all APHIS WS state and district offices and warehouses. All APHIS WS field employees who use pesticides have lockable boxes for transporting pesticides in their vehicles and lockable safes/vaults to safely store hazardous materials at their official duty station (office or home). In FY03-FY04, APHIS Physical Security Specialists conducted more than 100 security assessments of APHIS WS work sites. Where needs were identified, funds were made available for improvements.

**APHIS WS Management Information System (MIS)**

APHIS WS maintains a Management Information System (MIS) database to document activities that the program conducts in addressing wildlife damage conflicts. The MIS database includes program information related to requests for assistance that APHIS WS receives, and is not an accounting of all wildlife related conflicts such as those received by other agencies, organizations, or individuals. Therefore, the number of requests for assistance received by APHIS WS does not necessarily quantify the extent and distribution of wildlife damage. The MIS system contains program data related to requests for technical and operational assistance, application of a wide variety of methods, descriptions of damage problems, and a record of wildlife management activities to resolve damage problems. MIS data related to APHIS WS use of M-44s and LPCs during FY 1996-FY 2006 were evaluated for product use and species take discussions here.

MIS records contain program details about APHIS WS activities, including animal species taken, harassed, relocated, methods used, property characteristics (ownership, acreage, location), resources protected, damage data regarding resources affected (amount lost to wildlife damage and its value), date and duration of field activity, and other data. MIS data is entered by the APHIS WS employee conducting the activity and it is screened and corrected through a supervisory review process conducted at the APHIS WS District and State levels. The MIS system database supports project-specific and state level data summary and itinerary reviews. National MIS program data is summarized annually and made available to the public via Program Data Reports (PDR's) that are retained on the APHIS WS website. PDR's were reviewed and discussed in the petition to the EPA, and clarifications and corrections are provided in this document (below, and in Section 4.0). APHIS WS take of wildlife species is conducted pursuant to permits or other authorities to further wildlife conservation or other program/resource protection objectives, and is consistently recorded and reported to the public via MIS-based national data table summaries. Take data reported in the PDR's is in tabular form, which lists wildlife species, states, method, and number of animals, and target/nontarget take.

The following examples of APHIS WS take of double-crested cormorants and hawks, are provided to illustrate the program's use of the MIS system, and to clarify inaccuracies about WS' accountability that were contained in the petition to EPA. Neither example pertains directly to APHIS WS use of M-44s or LPCs, but they are included to address issues raised in the petition, and to highlight the program's application of IWDM and its database record-keeping process.

During FY 2006, WS took a total of 15,844 double crested cormorants, all target animals intentionally taken. Of these, 98% (15,590) were taken by WS in 16 states under federal Depredation Orders established by the FWS and supported by states, to protect aquaculture and public resources. The remaining 2% were taken by APHIS WS in other states to protect resources pursuant to federal and state permits or other authorities. For APHIS WS take of double-crested cormorants, and all other species reported taken by APHIS WS, take data that exists in the PDR's represents professional management programs implemented by APHIS WS through permits, agreements and other authorizations. MIS-maintained data such as this is used by APHIS WS to report management activities and describe resources protected, and to consider alternatives and potential impacts as part of NEPA documents and processes.

Additionally, the MIS-based PDR tables provide data that quantifies lethal and nonlethal management activities by APHIS WS. For example, a total of 298 hawks were killed by APHIS WS during FY 2006, primarily as part of integrated wildlife hazard management programs to protect public and military safety at airports and airfields. This take is focused on reducing bird-aircraft strikes, and is supported by Federal and state depredation permits, NEPA environmental analysis processes, and is conducted alongside ongoing nonlethal efforts, including the dispersal or relocation of 4,244 hawks during that same year. APHIS WS PDR's profile the program's integrated management approach to resolving wildlife-related problems.

MIS records pertaining to M-44 and LPC use by APHIS WS similarly contain detailed activity and program data, and were used to generate Tables 3, 4, 5, 6, and 7 in this document (Section 1.3). For clarification, the APHIS WS CMITS system tracks inventory of the products, and the MIS system tracks the program's use of the products.

## 1.3 APHIS WS Use of M-44s and LPCs

M-44s and LPCs are selectively applied by APHIS WS as part of an IWDM approach to reduce livestock and other resource depredation. While not the only consideration, LPCs are most often used during serious ongoing depredation events when other techniques have failed and are an important last line of defense to protect sheep and goats from coyotes. In addition to livestock protection, M-44s have been an important tool to prevent predation on T&E species such as the Aleutian Canada Goose.

The M-44 and LPC have been highly selective for target species (Tables 3, 4, and 6). Selectivity is a function of the management method used and its application in the field. No method is more selective, even at the most restrictive definition of the word, than the LPC because the LPC is designed to remove the predator in the act of killing livestock. Livestock Protection Collars used by APHIS WS resulted in the total take of four nontarget animals from FY96 to FY06, representing less than 1% of the total number of animals taken with this method. There are varying degrees and definitions of selectivity and APHIS WS considers a method to be selective as a PDM tool if its use specifically targets the predator species involved (coyotes, red, gray, and arctic foxes, and feral dogs in the case of M-44s and coyotes in the case of LPCs) in or near the area where the protected resources, such as sheep or other livestock, are vulnerable.

**APHIS WS M-44 Use**

The M-44 is registered for APHIS WS personnel and livestock producer use, but applicators must be specially trained and certified under FIFRA or state agencies to apply this pesticide (Appendices 7 and 8). The M-44 device consists of: (1) a capsule holder wrapped with fur, cloth, wool, or other soft material; (2) a capsule containing 880 mg of powdered sodium cyanide; (3) an ejector mechanism; and (4) a 5- to 7-inch hollow stake. Once it is set in the field and the M-44 device is pulled, a spring-activated plunger propels sodium cyanide into the animal's mouth. When sodium cyanide comes into contact with carbon dioxide or acids, it forms hydrogen cyanide gas. The gas is an asphyxiant that prohibits the use of oxygen in the blood of an animal. The characteristic response is a rapid loss of consciousness, followed by death of the animal. The product degrades rapidly when exposed to moisture. APHIS WS personnel who use M-44s carry an antidote kit and are trained in its use. The EPA label for the M-44 includes 26 use restrictions (Appendices 4 and 5) and APHIS WS personnel must be certified in its use. When properly used, the M-44 presents little risk to humans and the environment, and is an effective addition to IWDM programs to protect livestock and other resources from predator damage.

APHIS WS tracks the inventory of M-44 capsules with CMITS and documents use/application, M-44s fired, and animals taken with the MIS computerized database system. From FY96 to FY06, 18 APHIS WS State Programs used the M-44 (avg. 17 states per year). An annual average of about 17,647 animals were taken, with 96% of take being three species (all target canids): the coyote (90%), red fox (4%), and gray fox (2%) (Table 3).

From FY96 to FY06, APHIS WS set out M-44s for an average of 2,623 Thousand Method Nights[2] (TMN) annually. For APHIS WS, an annual average of 30,000 M-44s were fired in the field (Table 4) and 7,500 M-44s test-fired by APHIS WS personnel prior to placement to determine quality. Test firing a sample of M-44s is required for quality control, since moisture or other climatic conditions can reduce their operability. With the known take, the number of animals found for the number of M-44s fired averaged 60% (Table 4).

2 TMN (Thousand Method Nights) is a standard measure of effort to gauge efficacy of wildlife management capture methods (Waldien et. al 2004, Shivik et al, 2005). A thousand is the number most often used because take is often a small fraction of the number of nights a tool is in the field, To give an example of calculating TMN, 10 M-44s placed in the field for 100 nights would equal 1 TMN.

Not all animals are found because: 1) the discharge is not sprayed into the animal's mouth due to the animal grasping it from the side and not the top, and, therefore, the animal does not get a lethal dose; 2) an animal brushes up against the devices and discharges it; 3) the treated animal moves into dense cover and cannot be found; or 4) the animal is removed by another animal or people. The species composition of animals taken lethally that are not found is assumed to be similar to those found. Table 4 also illustrates the selectivity of M-44 use for target canids averaging 95% of all take. Nontarget canids listed on the label taken in addition to the target canids totaled 97% of all take. All mammalian carnivore take added to 99.9% of all take with less than 0.1% of the take being species other than mammalian carnivores. Thus, M-44s use pattern makes it highly selective for mammalian carnivores and, in particular, target canids.

On average, nearly one-fifth (19%) of all coyotes taken by APHIS WS nationally each year were taken with M-44s (Table 4). The value of M-44s in states where it is registered and in situations where predation management is essential, is not measured by the percentage or number of coyotes taken, but the effectiveness in resolving depredation problems. The petitioners are incorrect when they claim that a "low" percentage of coyotes taken by M-44s indicates its lesser value. Importance is related to the degree to which the tool can be incorporated into the overall IWDM approach, its selectivity, safety, and effectiveness in particular circumstances. Therefore, APHIS WS believes that the M-44 is an effective method and important for use by APHIS WS personnel.

APHIS WS took 6.4 target canids/TMN (Table 4) which is comparable to other methods. The soft-catch foot-hold trap, Collarum® neck restraint, and cage-trap resulted in 48, 27, and 0 coyotes/TMN, respectively (Shivik et al. 2005). Soft-catch foot-hold traps had the highest efficacy, but in this study required much more time to place (about three M-44s can be set in the time to set one foot-hold trap) and monitor (foot-hold traps have one- to three-day trap checks whereas M-44s require weekly checks). APHIS WS believes that M-44s are within the range of effectiveness for taking target coyotes and other canids and can be used efficiently to resolve problems for livestock producers.

The annual average number of APHIS WS M-44s fired in the field from FY96 to FY06 was 29,628 (Tables 4 and 5) and the number test fired was 7,480. Each capsule contains 880 mg of sodium cyanide. Therefore, the average annual amount of sodium cyanide released was 32.66 kg (72 lbs). This use occurred in 18 states with the majority of use on private lands. Use in states such as California, Arizona, and Colorado has declined from FY96 to FY06, but increased in other states such as Virginia, West Virginia, and Nevada (Table 5).

Sodium cyanide is also approved for vertebrate pest control in other countries in addition to the United States. However, industrial cyanide uses far exceed pesticide uses. The World Health Organization (WHO) estimates that more than 1,000,000 tons of cyanide, or 80% of the annual production, is used in the chemical industry world-wide. EPA's 2005 Toxic Release Inventory (TRI) records show that 5,867,390 pounds of cyanide compounds were disposed of or otherwise released by various industries in the United States (EPA 2007). The top three sources of cyanide compound releases were facilities in chemicals, primary metals, and metal mining. Use by APHIS WS is minimal and represents an average of only 0.001% of the cyanide compound releases in the United States alone.

Table 3. Animal species and number of individuals taken with M-44s by WS from FY96 to FY06.

| Species | FY96 | FY97 | FY98 | FY99 | FY00 | FY01 | FY02 | FY03 | FY04 | FY05 | FY06 | Ave | % Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Target Take | | | | | | | | | | | | | |
| Coyote | 21,939 | 18,232 | 19,406 | 18,151 | 16,347 | 16,362 | 14,832 | 13,046 | 11,586 | 11,667 | 12,596 | 15,833 | 89.7% |
| Red Fox | 1,203 | 916 | 807 | 834 | 644 | 611 | 539 | 400 | 330 | 287 | 320 | 626 | 3.6% |
| Gray Fox | 448 | 216 | 198 | 338 | 394 | 269 | 276 | 353 | 184 | 185 | 376 | 294 | 1.7% |
| Feral Dog | 119 | 82 | 105 | 59 | 68 | 63 | 45 | 34 | 35 | 30 | 49 | 63 | 0.35% |
| Arctic Fox | 19 | 5 | 6 | 9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0.02% |
| Subtotal | 23,728 | 19,451 | 20,522 | 19,391 | 17,453 | 17,305 | 15,692 | 13,833 | 12,135 | 12,169 | 13,341 | 16,820 | 95.3% |
| Nontarget Take | | | | | | | | | | | | | |
| Raccoon | 326 | 234 | 253 | 265 | 230 | 250 | 318 | 331 | 291 | 218 | 199 | 265 | 1.5% |
| Gray Fox | 181 | 115 | 111 | 133 | 122 | 81 | 102 | 156 | 93 | 116 | 87 | 118 | 0.67% |
| Feral Dog | 183 | 155 | 162 | 169 | 110 | 107 | 76 | 68 | 83 | 60 | 63 | 112 | 0.64% |
| Striped Skunk | 75 | 78 | 90 | 64 | 106 | 156 | 110 | 167 | 113 | 59 | 77 | 100 | 0.56% |
| Opossum | 99 | 52 | 62 | 82 | 109 | 143 | 82 | 83 | 96 | 64 | 113 | 90 | 0.51% |
| Red Fox | 87 | 64 | 97 | 87 | 69 | 53 | 91 | 55 | 69 | 71 | 76 | 74 | 0.42% |
| Kit Fox | 18 | 21 | 30 | 24 | 26 | 19 | 25 | 27 | 29 | 25 | 24 | 24 | 0.14% |
| Swift Fox | 8 | 8 | 28 | 17 | 8 | 12 | 7 | 16 | 19 | 8 | 21 | 14 | 0.08% |
| Feral Hog | 5 | 5 | 13 | 5 | 6 | 5 | 5 | 7 | 4 | 7 | 9 | 6 | 0.04% |
| Bobcat | 10 | 15 | 4 | 5 | 6 | 4 | 4 | 1 | 5 | 15 | 1 | 6 | 0.04% |
| Ringtail | 6 | 12 | 1 | 3 | 1 | 13 | 0 | 4 | 1 | 2 | 1 | 4 | 0.02% |
| Common Raven | 6 | 6 | 7 | 6 | 0 | 2 | 1 | 1 | 7 | 1 | 2 | 4 | 0.02% |
| American Crow | 5 | 3 | 3 | 2 | 3 | 0 | 0 | 0 | 0 | 4 | 1 | 2 | 0.01% |
| Black Bear | 2 | 1 | 0 | 2 | 3 | 0 | 3 | 1 | 0 | 4 | 2 | 2 | 0.01% |
| Coyote | 2 | 0 | 2 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 1 | <0.01% |
| Badger | 0 | 0 | 3 | 1 | 1 | 0 | 0 | 4 | 3 | 0 | 0 | 1 | <0.01% |
| Feral Cat | 4 | 0 | 1 | 0 | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 0.7 | <0.01% |
| Woodchuck | 0 | 0 | 0 | 4 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0.6 | <0.01% |
| Gray Wolf | 0 | 1 | 1 | 1 | 0 | 0 | 2 | 1 | 0 | 0 | 1 | 0.6 | <0.01% |
| Javelina | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 2 | 0 | 0.5 | <0.01% |
| Mountain Lion | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0.2 | <0.01% |
| Bald Eagle | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0.2 | <0.01% |
| Black Vulture | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0.2 | <0.01% |
| Chihuahuan Raven | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0.2 | <0.01% |
| Hog-nosed Skunk | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1 | <0.01% |
| White-tailed Deer | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1 | <0.01% |
| Western Scrub-Jay | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1 | <0.01% |
| Subtotal | 1,018 | 772 | 870 | 872 | 804 | 854 | 828 | 925 | 814 | 658 | 677 | 827 | 4.7% |
| | | | | | | | | | | | | | |
| Total | 24,746 | 20,223 | 21,392 | 20,263 | 18,257 | 18,159 | 16,520 | 14,758 | 12,949 | 12,827 | 14,018 | 17,647 | 100% |

Table 4. M-44s use by APHIS WS.

| M-44s fired and percent found | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | FY96 | FY97 | FY98 | FY99 | FY00 | FY01 | FY02 | FY03 | FY04 | FY05 | FY06 | Ave |
| M-44s fired | 39,471 | 33,909 | 34,981 | 33,193 | 30,046 | 27,990 | 27,062 | 26,089 | 24,326 | 22,852 | 25,993 | 29,628 |
| Total Take (28 spp.) | 24,746 | 20,223 | 21,392 | 20,263 | 18,257 | 18,159 | 16,520 | 14,758 | 12,949 | 12,827 | 14,018 | 17,647 |
| % Animals Found | 63% | 60% | 61% | 61% | 61% | 65% | 61% | 57% | 53% | 56% | 54% | 60% |
| M-44s Fired, All Animals Taken, and Coyotes taken/1,000 Method Nights (TMN) | | | | | | | | | | | | |
| WS M-44 TMN | 4,130 | 3,093 | 3,182 | 2,938 | 2,623 | 2,412 | 2,373 | 2,233 | 1,906 | 1,694 | 2,269 | 2,623 |
| # Fired/TMN | 9.6 | 11.0 | 11.0 | 11.3 | 11.5 | 11.6 | 11.4 | 11.7 | 12.8 | 13.5 | 11.5 | 11.3 |
| Target Take | 23,728 | 19,451 | 20,522 | 19,391 | 17,453 | 17,305 | 15,692 | 13,833 | 12,135 | 12,169 | 13,341 | 16,820 |
| # Targets/TMN | 5.7 | 6.3 | 6.4 | 6.6 | 6.7 | 7.2 | 6.6 | 6.2 | 6.4 | 7.2 | 5.9 | 6.4 |
| Nontarget Take | 1,018 | 772 | 870 | 872 | 804 | 854 | 828 | 925 | 814 | 658 | 677 | 827 |
| Nontargets/TMN | 0.2 | 0.3 | 0.3 | 0.3 | 0.3 | 0.4 | 0.3 | 0.4 | 0.4 | 0.4 | 0.3 | 0.3 |
| M-44 Target Take by the WS Program Nationwide and Selectivity for Targets, Canids, and Carnivores | | | | | | | | | | | | |
| Total (5 spp.) | 23,728 | 19,451 | 20,522 | 19,391 | 17,453 | 17,305 | 15,692 | 13,833 | 12,135 | 12,169 | 13,341 | 16,820 |
| % Targets of All Take | 95.9% | 96.2% | 95.9% | 95.7% | 95.6% | 95.3% | 95.0% | 93.7% | 93.7% | 94.9% | 95.2% | 95.3% |
| Total Nontarget Canids | 479 | 364 | 431 | 431 | 335 | 280 | 303 | 323 | 293 | 280 | 272 | 345 |
| Total Canids | 24,207 | 19,815 | 20,953 | 19,822 | 17,788 | 17,585 | 15,995 | 14,156 | 12,428 | 12,449 | 13,613 | 17,165 |
| % Canids of All Take | 97.8% | 98.0% | 97.9% | 97.8% | 97.4% | 96.8% | 96.8% | 95.8% | 96.0% | 97.1% | 97.1% | 97.3% |
| Total Other Carnivore* | 523 | 392 | 415 | 422 | 459 | 566 | 518 | 591 | 509 | 362 | 393 | 468 |
| Total Carnivores | 24,730 | 20,207 | 21,368 | 20,244 | 18,247 | 18,151 | 16,513 | 14,747 | 12,937 | 12,811 | 14,006 | 17,633 |
| % Carnivores of Take | 99.9% | 99.9% | 99.9% | 99.9% | 99.9% | 100.0% | 100.0% | 99.9% | 99.9% | 99.9% | 99.9% | 99.9% |
| M-44 Compared to All Take by WS Program Nationwide with All Methods | | | | | | | | | | | | |
| Species | FY96 | FY97 | FY98 | FY99 | FY00 | FY01 | FY02 | FY03 | FY04 | FY05 | FY06 | Ave |
| All WS Coyotes | 82,243 | 82,391 | 77,985 | 85,927 | 86,944 | 88,853 | 86,348 | 75,714 | 75,622 | 72,751 | 87,476 | 82,023 |
| All Coyote w/ M-44 | 21,941 | 18,232 | 19,408 | 18,151 | 16,347 | 16,370 | 14,832 | 13,046 | 11,586 | 11,667 | 12,596 | 15,834 |
| % M-44 Coyote Take | 27% | 22% | 25% | 21% | 19% | 18% | 17% | 17% | 15% | 16% | 14% | 19% |

* Includes Opossum

Ave. 7.6 Other Mammals/Year (4 spp.) and 6.1 Birds/Year (6 spp.)

Table 5. M-44s fired/discharged in the field by the APHIS WS state programs that used M-44s from FY96 to FY06.

| M-44 Fired by the WS Program Nationwide | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| State | FY96 | FY97 | FY98 | FY99 | FY00 | FY01 | FY02 | FY03 | FY04 | FY05 | FY06 | Ave |
| AK | 20 | 47 | 20 | 19 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 10 |
| AZ | 710 | 779 | 215 | 75 | 24 | 14 | 109 | 0 | 28 | 0 | 6 | 178 |
| CA | 3,349 | 3,864 | 3,961 | 302 | 0 | 0 | 72 | 70 | 54 | 50 | 48 | 1,070 |
| CO | 538 | 201 | 318 | 188 | 295 | 343 | 108 | 47 | 22 | 41 | 54 | 196 |
| ID | 702 | 608 | 615 | 462 | 461 | 567 | 288 | 187 | 173 | 114 | 152 | 394 |
| MT | 2,081 | 1,864 | 2,438 | 2,201 | 1,432 | 1,280 | 1,169 | 802 | 667 | 672 | 682 | 1,390 |
| ND | 1,223 | 325 | 728 | 532 | 578 | 605 | 849 | 892 | 690 | 986 | 768 | 743 |
| NE | 2,922 | 2,420 | 2,416 | 2,267 | 2,147 | 2,523 | 2,407 | 2,158 | 1,438 | 1,316 | 961 | 2,089 |
| NM | 4,482 | 2,704 | 2,823 | 2,965 | 2,732 | 2,510 | 1,780 | 1,800 | 1,359 | 1,348 | 1,502 | 2,364 |
| NV | 0 | 21 | 253 | 249 | 291 | 131 | 98 | 136 | 70 | 31 | 121 | 127 |
| OK | 3,947 | 3,631 | 3,049 | 3,964 | 3,543 | 3,114 | 3,722 | 3,558 | 3,460 | 2,799 | 2,599 | 3,399 |
| OR | 2,300 | 1,835 | 1,496 | 1,383 | 942 | 795 | 335 | 224 | 158 | 116 | 317 | 900 |
| TX | 14,934 | 12,796 | 12,963 | 13,528 | 13,303 | 12,756 | 12,651 | 14,064 | 13,829 | 12,603 | 15,703 | 13,557 |
| UT | 792 | 741 | 737 | 976 | 944 | 915 | 700 | 710 | 598 | 646 | 718 | 771 |
| VA | 145 | 369 | 563 | 1,045 | 638 | 639 | 897 | 538 | 810 | 967 | 1,170 | 707 |
| WA | 112 | 159 | 358 | 581 | 610 | 326 | 0 | 0 | 0 | 0 | 0 | 195 |
| WV | 163 | 335 | 746 | 702 | 782 | 559 | 675 | 315 | 475 | 620 | 680 | 550 |
| WY | 1,051 | 1,210 | 1,282 | 1,754 | 1,321 | 913 | 1,202 | 588 | 495 | 543 | 512 | 988 |
| Total | 39,471 | 33,909 | 34,981 | 33,193 | 30,046 | 27,990 | 27,062 | 26,089 | 24,326 | 22,852 | 25,993 | 29,628 |

**APHIS WS LPC Use**

The LPC (EPA label, Appendix 6) is registered for APHIS WS personnel and livestock producer use. Applicators must be specially trained and certified under FIFRA to use the LPC. LPC use is restricted to fenced pastures where coyote predation on sheep or goats has occurred. The LPC consists of two rubber reservoirs, each filled with about ½ oz. of a 1% solution of sodium fluoroacetate (Compound 1080), or about 152 mg of active ingredient in each reservoir. Each LPC has a collar serial number, which allows record-keeping and inventory of individual units. The LPC, attached to the neck of a sheep or goat, dispenses the Compound 1080 solution when punctured by the bite of an attacking predator. The LPC is selective not only for the target species, but also for target individuals while they are exhibiting a particular behavior (biting the throat of a goat or sheep). Coyotes characteristically attack sheep and goats by grabbing the throat, whereas other wildlife and dogs attack the animal elsewhere on the body (e.g., dogs attack the flanks and mountain lions the back of the neck or skull). As a result, very few dogs and nontarget animals are taken to resolve depredations on pastured sheep and goats. The advantage of the LPC is its selectivity in eliminating only those individual predators that are responsible for attacking sheep and goats at the throat (Connolly et al. 1978, Burns et al. 1988). Use of the LPC is best justified in areas with a high frequency of predation (i.e., at least one kill per week) or flocks of high value such as registered livestock.

Secondary poisoning risk is reduced because scavengers tend not to feed on the wool of the sheep's neck. A detailed risk assessment for sodium fluoroacetate in the LPC is provided in USDA (1997, Appendix P) which concluded that use of the LPC would pose little likelihood of a dog being poisoned because they usually attack flanks and not the throat, and that secondary hazards were at most minimal. In addition, the LPC is used in very limited situations, as specified on the label. APHIS WS LPC records indicate only two incidents of exposure to domestic dogs of sodium fluoroacetate from an LPC. Nontarget take associated with APHIS WS field application of LPCs during FY 1996-2006 has only involved 4 animals, representing less than 0.8% of animals taken. There has been no nontarget species taken by APHIS WS field use of the LPC since FY2002.

In most LPC projects, typically one of the LPC reservoirs is punctured, thus releasing only 152 mg of active ingredient into the environment. This is especially true for punctures not associated with predator attacks such as from cactus or barbed wire fence; cactus spines are often broken off and block the contents from being drained. Thus, in determining the potential environmental release potential from LPCs, APHIS WS considers the maximum potential amount of sodium fluoroacetate lost, but it is likely closer to half because most collars only have one reservoir damaged and not all contents from those damaged may be lost. The MIS data summarizing the annual average number of LPCs damaged or lost, (132 or about 6% of the number placed) can be used to estimate the amount of sodium fluoroacetate exposed to the environment. Since each LPC contains about 300 mg of active ingredient equally divided between two bladders, the maximum possible average release nationwide by APHIS WS from these LPCs is 39.6 g or 0.0396 kg of active ingredient per year. During inspections, damaged collars are taken off the sheep and the collar and any contaminated wool are disposed according to label procedures. APHIS WS conducts detailed accounting procedures on LPCs through use of the MIS and CMITS systems. Program personnel record and verify use, changes in inventory, transfer between program personnel, field use, and fate of each unit.

The LPC is very effective at targeting depredating coyotes that have evaded other management methods. From FY96 to FY06, APHIS WS applied LPCs for an average of 52.4 TMN with an average of 132 LPCs being damaged annually (Table 6). APHIS WS took an average of 47 targeted coyotes annually with the LPC during FY96—FY06, which was 0.06% of the targeted coyotes taken nationally with all PDM methods (Table 6). Similar to the M-44, the number of coyotes taken with LPCs is not a direct indicator of its effectiveness. Its success and value are based on its effectiveness at resolving particular problems, its

selectivity and safety, and its incorporation into integrated management programs. The LPC is an important and selective tool for very specific applications.

APHIS WS conducts an average of 70 LPC projects each year, and its continued availability is very important to livestock producers with serious sheep or goat predation problems. The average project lasts about 25 days, and involves about 30 collared sheep or goats. An average of 2.5 LPCs were damaged per TMN. Coyotes accounted for 0.9 fires/TMN (Table 6). The remaining damage occurred due to LPCs being punctured by thorns, cactus, barbed wire, or other items. Nontarget take with LPCs in the field is extremely low (3 bobcats and 1 dog) during FY96-FY06, and has averaged less that 0.1% of take with this method (Table 6). Since the coyote is the only target wildlife species listed for the LPC, the bobcats and dog are considered nontarget animals; these predators would have been targeted with other methods because they did kill the sheep or goat that was wearing an LPC.

APHIS WS' MIS data management system allows tracking of the number of LPCs applied, punctured by predators and other causes, damaged for other reasons, and lost. In FY06, APHIS WS applied 2,041 collars, had 49 punctured by predators and 64 damaged or lost. Most predator punctures were determined to be coyotes (47 of 49). The additional two punctures were also likely coyotes, but could not be verified.

Table 6. LPC use by APHIS WS.

| LPC Thousand Method Nights (TMN), Number Punctured/Damaged, and Species Take by APHIS WS Program Nationwide | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Fiscal Year | FY96 | FY97 | FY98 | FY99 | FY00 | FY01 | FY02 | FY03 | FY04 | FY05 | FY06 | Ave. |
| WS LPC TMN | 54.2 | 60.4 | 68.2 | 38.5 | 47.2 | 42.3 | 44.5 | 48.1 | 58.0 | 52.4 | 62.8 | 52.4 |
| LPCs Damaged | 182 | 132 | 142 | 89 | 103 | 158 | 145 | 142 | 117 | 134 | 113 | 132 |
| # LPCs/TMN | 3.4 | 2.3 | 2.3 | 2.3 | 2.2 | 3.7 | 3.3 | 3.0 | 2.0 | 2.6 | 1.8 | 2.6 |
| Target Take | | | | | | | | | | | | |
| Coyote | 46 | 62 | 54 | 34 | 27 | 60 | 43 | 40 | 47 | 52 | 47 | 47 |
| Nontarget Take | | | | | | | | | | | | |
| Bobcat | 1 | - | - | 1 | - | - | 1 | - | - | - | - | 0 |
| Feral Dog | - | - | - | - | 1 | - | - | - | - | - | - | 0 |
| Total All Take | 47 | 62 | 54 | 35 | 28 | 60 | 44 | 40 | 47 | 52 | 47 | 47 |
| Species per TMN | | | | | | | | | | | | |
| Coyotes/TMN | 0.9 | 1.0 | 0.8 | 0.9 | 0.6 | 1.4 | 1.0 | 0.8 | 0.8 | 1.0 | 0.7 | 0.9 |
| Nontarget/TMN | 0.02 | 0 | 0 | 0.03 | 0.02 | 0 | 0.02 | 0 | 0 | 0 | 0 | 0.01 |
| % Nontargets | 2.1% | 0% | 0% | 2.9% | 3.6% | 0% | 2.3% | 0% | 0% | 0% | 0% | 0.8% |
| Comparison of LPC Coyote Take with All APHIS WS Take | | | | | | | | | | | | |
| All WS Coyote | 82,243 | 82,391 | 77,985 | 85,927 | 86,944 | 88,853 | 86,348 | 75,714 | 75,622 | 72,751 | 87,476 | 82,023 |
| LPC Coyotes | 46 | 62 | 54 | 34 | 27 | 60 | 43 | 40 | 47 | 52 | 47 | 47 |
| % of WS Take | 0.06% | 0.08% | 0.07% | 0.04% | 0.03% | 0.07% | 0.05% | 0.05% | 0.06% | 0.07% | 0.05% | 0.06% |

Use of LPCs by APHIS WS remained relatively stable from FY96 to FY06 (Table 6). Although use in states such as California and Idaho has declined, use in other states such as Ohio and Pennsylvania has increased (Table 7). The LPC is a tool that is often effectively used when other methods have not stopped a coyote predation problem. Because the LPC is selective, safe, and effective, its continued availability is supported.

Environmental release of Compound 1080 occurs only when the LPC has been punctured. The LPC is one of the most target specific and lowest environmental risk pesticide products available for any use. The LPC targets the specific animal that is killing livestock. APHIS WS uses LPCs in limited, specialized situations, and takes relatively few coyotes (e.g., 47 coyotes taken by 49 LPCs punctured by predators in FY06). The relatively low number of punctured LPCs indicates the specificity of this technique.

Table 7. The number of LPCs punctured/damaged during field use by APHIS WS State Programs, FY96—FY06.

| LPC Punctured/Damaged by the WS Program Nationwide | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| State | FY96 | FY97 | FY98 | FY99 | FY00 | FY01 | FY02 | FY03 | FY04 | FY05 | FY06 | Ave. |
| CA | - | 11 | 9 | - | - | - | - | - | - | - | - | 2 |
| ID | - | - | - | - | 5 | - | - | - | - | - | - | 0 |
| NM* | 81 | 25 | 23 | 16 | 18 | 35 | 15 | 52 | 18 | 16 | 34 | 30 |
| OH | - | - | - | - | - | - | - | - | 1 | - | 1 | 0 |
| PA | - | - | - | - | - | - | - | - | - | - | 3 | 0 |
| TX | 78 | 70 | 87 | 66 | 79 | 108 | 115 | 74 | 84 | 87 | 55 | 82 |
| UT | 6 | - | - | - | - | - | - | - | - | - | - | 1 |
| VA | - | 13 | 8 | 2 | - | 2 | 3 | 3 | - | 6 | - | 3 |
| WV | 17 | 13 | 15 | 5 | 1 | 13 | 12 | 13 | 14 | 25 | 20 | 13 |
| Total | 182 | 132 | 142 | 89 | 103 | 158 | 145 | 142 | 117 | 134 | 113 | 132 |

*Data from LPC use reports, all other from APHIS WS program data reports

Sodium fluoroacetate has been the subject of much research in the United States and elsewhere, and has been used in many countries. Fluoroacetic acid and related chemicals occur naturally in plants in many parts of the world and are not readily absorbed through intact skin (Atzert 1971). Sodium fluoroacetate is discriminatingly toxic to predators, being many times more lethal to them than to most nontarget species (Atzert 1971, Connolly and Burns 1990). The LPC is registered in three countries, including the United States where it is currently the only EPA registered formulation. Sodium fluoroacetate is registered as a vertebrate pest control product in at least six countries, including New Zealand, where an estimated 2,500 kg of Compound 1080 is used annually in vertebrate pest control activities.

## 1.4 Collaboration and Consultation to Evaluate Impacts to Wildlife

APHIS WS evaluates potential effects of the use of M-44s and LPCs on target and nontarget species populations and collaborates and consults on the effects of these PDM methods with the appropriate federal and state management agencies depending on the species being evaluated. In general, mammalian carnivore species, with the exception of federally designated T&E species, are managed by state agencies. Migratory birds and T&E species are managed by FWS, often with assistance from state agencies. The effects of target and nontarget wildlife removal are analyzed as per NEPA with consultations specifically addressing impacts to T&E species conducted pursuant to the ESA. APHIS WS also evaluates the effect that wildlife removal has on other resources such as recreation.

**APHIS WS Compliance with the National Environmental Policy Act (NEPA)**

Predator Damage Management methods used by APHIS WS were reviewed in a programmatic Environmental Impact Statement (USDA 1997) and Environmental Assessments completed at the state or local level where direct operational management is conducted (APHIS WS 2007). Most of the issues brought forth by the petitioners regarding the use of M-44s and LPCs were evaluated through APHIS WS-conducted EA processes. They analyzed impacts of PDM methods (including M-44s and LPCs) on target and nontarget species, T&E and sensitive species, and on public and pet health and safety. The EAs also considered the effects of the use of PDM methods on recreation (including hunting and wildlife watching), and humaneness. Many of the petitioner groups (such as Sinapu on behalf of many of the other petitioners in the Colorado PDM EA) have been involved in the public comment process for these EAs and have had their issues and concerns addressed during the public comment processes (APHIS WS 2005).

**APHIS WS Compliance with the Endangered Species Act (ESA)**

Under Section 7 of the Endangered Species Act (ESA) of 1973, as amended [16 USC 1531-1543], all federal agencies must conserve T&E species and use their authorities in furtherance of the purposes of ESA [3, 4] (Sec.2(c)). APHIS WS partners closely with the FWS to ensure compliance with the ESA, and to develop acceptable procedures while using M-44s and LPCs according to agreements and measures established to conserve T&E species. This partnership typically occurs through consultations and conferencing, and the development of Biological Assessments, BOs, conferences, and concurrence agreements. Regarding conservation of T&E species, APHIS WS operates program activities under the Reasonable and Prudent Measures and Alternatives as identified in a BO issued by the FWS in 1992 (USDA 1997), and under subsequent BOs issued by FWS for state level programs. The ESA consultation process is constantly being conducted and updated to ensure APHIS WS compliance with ESA. Additionally, based on a thorough Risk Assessment, APHIS WS concluded that when APHIS WS program chemicals are used according to label directions, they are selective to target individuals or populations, and their use has negligible impacts on the environment (USDA 1997, Appendix P). APHIS WS uses pesticides that have been approved by the EPA and in the states where the pesticide is registered. Program personnel comply with State pesticide agency/program requirements for inspections, registration and training, record pesticide applications through the MIS system, and record inventory information in the CMITS system.

Section 10(j) of the ESA enables the FWS to designate certain populations of federally listed species that are released into the wild as "experimental[5]." Experimental-Nonessential Populations (X/N) located outside National Wildlife Refuge System or National Park System lands are treated, for the purposes of Section 7 of the ESA, as if they are proposed for listing. For these populations, only two provisions of Section 7 apply outside National Wildlife Refuge System and National Park System lands; section 7(a)(1), which requires all Federal agencies to use their authorities to conserve listed species, and section 7(a)(4), which requires Federal agencies to informally confer with the FWS on actions that are likely to jeopardize the continued existence of a proposed species. Section 7(a)(2) of the ESA, which requires federal agencies to ensure that their activities are not likely to jeopardize the continued existence of a listed species, does not apply except on National Wildlife Refuge System and National Park System lands.

If FWS determines that a proposed action is likely to adversely affect or jeopardize the continued existence of a protected species, the agency must avoid or mitigate the proposed action so that the adverse action is avoided or the adverse impact is reduced to an acceptable level. APHIS WS considers all federal and state T&E species, and proposed and candidate species for the federal list, and determines whether or not APHIS WS actions will have an effect on these species. APHIS WS actions are an ongoing nationwide program, which has been previously reviewed under a formal Section 7 consultation (USDA 1997 Appendix F). Most predation damage management methods used in the APHIS WS program were included in the BO (USDA 1997 Appendix F). APHIS WS abides by the Reasonable and Prudent Alternatives and Measures and Terms and Conditions contained in the programmatic BO, as well as those contained in BOs completed since 1997 for particular species, programs, and states.

For the M-44, Use Restriction #9 states, "*The M-44 device shall not be used in areas where federally listed threatened or endangered animal species might be adversely affected. Each applicator shall be issued a map, prepared by or in consultation with the U.S. Fish and Wildlife Service, which clearly indicates such areas.*" Both APHIS WS and the EPA have consulted with FWS to determine the risks posed by pesticides

3 WS is assisting several States are conducting projects to protect T&E and sensitive species from predation, competitors, or invasive species.

4 With regard to specific T&E species, these are addressed through Section 7 consultations, and relevant provisions from the Section 7 consultations are included as minimization measures, SOPs and in Work Plans with other agencies.

5 The experimental designation increases management flexibility of a reintroduced species, because under section 10(j) an experimental population is treated, in certain instances, as a threatened species regardless of its designation elsewhere in its range, and under section 4(d) of the ESA, the USFWS has greater discretion in developing management programs for threatened species than it has for endangered species.

to T&E species. In some cases, such as the California condor, reasonable and prudent measures were put into effect to preclude incidental take. In other cases, such as the gray wolf and ocelot, FWS clearly defined "occupied range" or "occupied habitat" as the areas where M-44s shall not be used.

**Target Species Take from APHIS WS Use of the M-44 and LPC**

The M-44 is used to target coyotes, red, gray and arctic foxes, and feral dogs. The LPC is used to target only coyotes. These species are managed by state agencies and APHIS WS evaluates potential impacts with these management agencies routinely.

Target Take of Coyotes. NASS (2006) reported coyotes caused the majority of cattle and calf losses to predation in the United States, accounting for 51.1%. Similarly, coyotes caused 60.5% of sheep and lamb losses to predation in the United States (NASS 2005). APHIS WS take of coyotes nationally averaged 82,000 from FY96-FY06 with 19% of that attributed to the M-44 (annual average 15,833 target coyotes taken with M-44's) and LPC (annual average of 47 target coyotes taken with LPCs). To put this number into perspective, APHIS WS's national average coyote take is roughly equivalent to the number of coyotes harvested by sportsmen in just two states - Colorado and Arizona - during the 1999-00 to 2004-05 hunting seasons where the average annual reported harvest by private hunters and trappers is about 80,000 coyotes.

During 2004, APHIS WS took about 76,000 coyotes in 33 states, while hunters and trappers harvested 250,000 (77% of all coyotes taken) in 34 states that reported harvest data to APHIS WS. In the west, coyotes have been determined to occur at densities of 0.5 to 1.0 coyotes per $mi^2$ (Knowlton 1972). If this density is extrapolated to the 48 contiguous states, (an area of about 3 million square miles), a conservative estimate of the coyote population using the low density would be about 1.5 million coyotes. Total take (combined APHIS WS take and harvest by sportsmen) is estimated to be less than 25% of the coyote population, which is less than half of the take level determined to be sustainable for coyote populations. APHIS WS NEPA analyses have found that cumulative coyote take in predation damage management programs by APHIS WS and the public along with sport harvest and other known take has not impacted this species' population at the statewide or more local level (e.g., APHIS WS 2002, 2005, 2006, 2007).

Target Take of Red Fox. Nationally, APHIS WS took an average of 626 target red fox annually with the M-44 from FY96 to FY06. APHIS WS's take of red fox is a small fraction of the harvest by private hunters and trappers, as indicated by the harvest by sportsmen in just the state of Colorado alone, which averaged nearly 1,000 annually for the 1999-00 to 2004-05 harvest seasons. APHIS WS NEPA analyses have found that cumulative red fox take in predation damage management programs by APHIS WS and the public along with sport harvest and other known take, has not impacted this species' population at the statewide or local level (e.g., APHIS WS 2002, 2005, 2006, 2007).

Red fox are found throughout North America in cooler climates, but were primarily native to higher elevation areas in the West and are considered to be an invasive species in many areas throughout the United States. Much debate has occurred about the distribution of native versus nonnative red foxes in the United States (Voigt 1999, Kamler and Ballard 2002). Red fox were brought from Europe for fox hunting and fur farms and subsequently released. It is believed that the European red fox invaded much of the East and West, greatly expanding its range in the United States, because of the species' adaptability to living in close association with people.

Target Take of Gray Fox. APHIS WS took an average of 294 target gray fox with the M-44 from FY96—FY06. By comparison, sportsmen harvest in just the state of Arizona alone averaged more than 5,000 annually for the 1999-00 to 2004-05 hunting seasons, indicating that APHIS WS gray fox take is a small fraction of the take allowed and reported by state wildlife management agencies. APHIS WS NEPA analyses have found that cumulative gray fox take in predation damage management programs by APHIS

WS and the public along with sport harvest and other known take has not impacted this species' population at the statewide or more local level. (e.g., APHIS WS 2002, 2005, 2006, 2007).

Target Take of Feral Dogs. Primary responsibility for controlling feral/free-ranging dogs typically resides with state and local authorities. APHIS WS responds to requests from local government entities including health departments, and implements control activities in cases where feral/free-ranging dogs are associated with livestock predation or to protect poultry, property, and human health and safety. Take of target feral dogs with M-44s by APHIS WS nationally has averaged 63 animals per year during the period FY96-FY06. APHIS WS take of dogs in these specific damage situations is exceedingly small, and is a tiny fraction of the number of dogs killed by animal control and humane organizations.

Target Take of Arctic Fox. Arctic fox were introduced onto many islands in Alaska's Aleutian Islands, where APHIS WS conducts predation damage management activities to protect nesting birds, including T&E species. Invasive Arctic foxes have been identified as having negative impacts to the federally threatened Aleutian Canada goose. APHIS WS takes relatively few target Arctic fox with M-44s, an average of four annually from FY96 to FY06, with no resulting impact on the species populations.

APHIS WS NEPA documents are available online (APHIS WS 2007). These documents further clarify that APHIS WS take of coyotes, red fox, gray fox, feral dogs, and arctic fox does not impact national, regional, or local populations of these target species, and that take is consistent with federal and state laws and regulations. APHIS WS purposeful take of coyotes, feral dogs, red fox, gray fox, and arctic fox is conducted through partnerships and programs with other governmental agencies and cooperating entities to alleviate wildlife damage to livestock and other resources.

**Nontarget Species and APHIS WS Use of the M-44 and LPC**

APHIS WS take of nontarget animals with M-44s and LPCs is less than 5% and 1% of total animals taken with each of these methods, respectively, which illustrates the overall specificity of these methods (Tables 3, 4, and 6). APHIS WS operating procedures and policy directives, as well as product use restrictions, reduce the effects of predation management activities on nontarget species populations. APHIS WS has considered the potential impact of nontarget take through environmental analyses, and has concluded that it does not significantly impact the involved species (e.g., APHIS WS 2002, 2005, 2006, 2007). For LPCs, only four nontarget animals were taken during FY96-FY06: three bobcats and one feral dog. It is important to note, that although these species are nontargets for the LPC, they would normally be considered as target species in the particular situations in which they have been taken with LPCs and would normally have been targeted by predation management using other methods.

To illustrate, in FY2000, APHIS WS deployed LPCs to target a coyote that had been killing sheep on a ranch in Idaho. A feral dog attacked a sheep wearing an LPC and the dog was killed as a result of puncturing the collar. The feral dog's death occurred because the dog attacked the sheep in a typical coyote predation fashion. Although the dog was taken unintentionally and thus determined to be a nontarget in terms of LPC use, it was a target in terms of the broader predation management objective in that situation, and would likely have been removed anyway, either by the rancher or by local authorities, if not by APHIS WS.

No nontarget take by APHIS WS with LPCs has occurred since FY02 (Table 6). For APHIS WS, use of M-44s during FY96-FY06, nontarget take averaged 827 animals program-wide annually. Annual average nontarget take exceeded 100 individuals for only four species, the raccoon, gray fox, feral dog, and striped skunk. It is noted that four of the species listed as nontargets (Table 3) (gray fox, feral dogs, red fox, and coyote) are target species (listed on product labels), but were counted as "nontarget take" in situations where APHIS WS methods had not been focused on that species in that situation. The level of nontarget take (5% for M-44 and less than 1% for the LPC) has no perceivable impact on their populations, and with the

exception of feral dogs, these species are harvested in relatively large numbers by sportsmen. Less than 0.1% of all animals taken by APHIS WS with M-44s are not carnivores. Nontarget take data illustrates the methods' selectivity, and APHIS WS continues to focus management and operational efforts to minimize impacts to nontarget species.

**Threatened and Endangered Species and APHIS WS Use of the M-44 and LPC**

Several T&E species and species of special concern are discussed here, as they were mentioned in the petition to EPA. APHIS WS consults and confers closely with the FWS pursuant to the ESA, and has completed a national consultation in 1992 and has conducted regional/statewide BOs for many of these species.

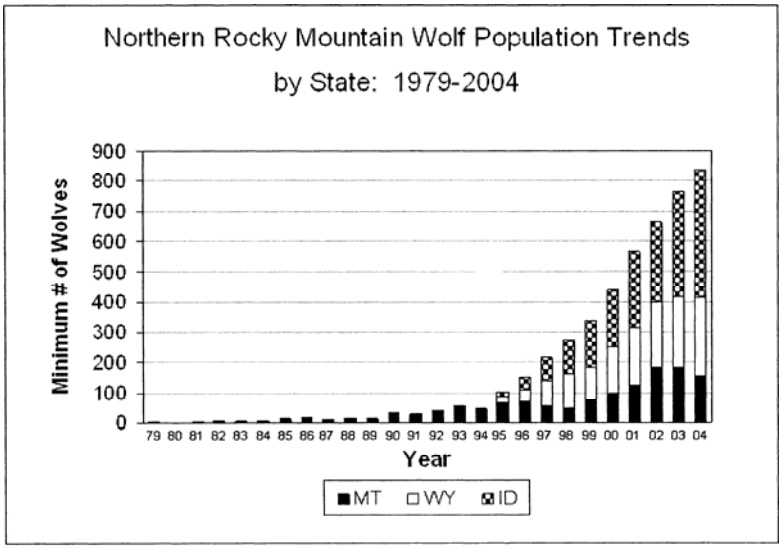


**Figure 1. Northern Rocky Mountain wolf population estimates by states reported in Interagency Annual Wolf Status Reports.**

**Gray Wolf**

There are documented records of 10 gray wolves taken by APHIS WS using M-44s and none with LPCs during 1995-2007 (Table 8). The gray wolf was extirpated from much of the lower 48 states by the first half of the twentieth century, and it was classified by the FWS as endangered there in 1967. Gray wolves have several populations in the United States including naturally occurring populations in the Great Lakes Region (Eastern timber wolf) and in Northern Idaho and Montana (Northern Rocky Mountain area), and potentially a third, believed to be extirpated, in southern New Mexico and Arizona (Mexican Wolf). Starting in 1994, FWS designated portions of Idaho, Montana, and Wyoming as two experimental/nonessential X/N population areas to reintroduce the gray wolf under section 10(j) of the ESA. The Western Great Lakes Distinct Population Segment (DPS) of gray wolves was delisted in 2007 (72 FR 6051-6103), and the Northern Rocky Mountain DPS was delisted in 2008 (73 FR 10514-10560).

The FWS issued a Biological Opinion (BO) on the naturally occurring Northern Rocky Mountain (NRM) gray wolf population and Eastern timber wolf in Minnesota, and Wisconsin (USDA 1997 Appendix F), and issued APHIS WS incidental take permits for these populations. The FWS provided allowances for take during the designation of the two X/N populations in Idaho, Montana, and Wyoming in the final rulemaking for the experimental population, and has also issued permits to APHIS WS in Idaho, Montana, and Wyoming for these wolves under 10j of the ESA. In 2000, FWS designated an X/N population in New Mexico and Arizona for the Mexican gray wolf under section 10(j) of the ESA and wolves were released in a remote area along the central border of the two states. APHIS WS received a BO and Conference Opinions for the Mexican wolf (FWS 1998) and an incidental take statement. APHIS WS continues to abide by the Reasonable and Prudent Alternatives, and Reasonable and Prudent Methods and Terms and Conditions identified by FWS to avoid jeopardy to the species and to minimize the risk of incidental take of Mexican wolves. No Mexican gray wolves have been taken incidentally by WS with M-44s, LPCs, or any other predation management method since the initiation of the Mexican wolf reintroduction program.

Table 8. Number of nontarget gray wolves taken by APHIS WS with M-44's between 1995 and 2007.

| STATE | Date | X/N[1] | Land Status | Within Known Range | Within Incidental Take of BO | Measures to Prevent Additional Take |
|---|---|---|---|---|---|---|
| Idaho[2] | Jan. 1995 | No | Private | No | Yes | WS conducts surveys prior to setting equipment |
| | Jan. 2007 | Yes[3] | Private | Yes | NA[1] | WS contacts the appropriate agencies and follows protocol[3] |
| | Jan. 2007 | Yes[3] | Private | Yes | NA[1] | WS contacts the appropriate agencies and follows protocol[3] |
| Montana[4] | May 1997 | Yes | Private | Yes | NA[1] | WS contacts the appropriate management agency(ies) and follows protocol[4] |
| | April 1998 | Yes | Private | Yes | NA[1] | WS contacts the appropriate management agency(ies) and follows protocol[4] |
| | Sept. 2002 | Yes | Private | Yes | NA[1] | WS contacts the appropriate management agency(ies) and follows protocol[4] |
| | Sept. 2002 | Yes | Private | Yes | NA[1] | WS contacts the appropriate management agency(ies) and follows protocol[4] |
| North Dakota | 2003 | No | Private | No | No | WS prepared and provided a Biological Assessment to the USFWS Ecological Services, Bismarck Field Office. WS also requested a formal Section 7 consultation. |
| | 2006 | No | Private | No | Yes | BO R&P Measures were followed |
| Wyoming | Dec. 1998 | Yes | Private | Yes | NA[1] | WS is working with USFWS under the working ground rule that if a pair moves into an area where we have M-44s, we will then pull the equipment. |

[1] Incidental take provision does not apply to the X/N population and the standard for management operations under X/N areas is whether "reasonable due care" has been used to avoid unintentional take (59 FR 60252 and 60266, November 22, 1994). Species designated as "experimental nonessential populations" under the ESA, section 10(j) are defined as "populations . . .authorized by the Secretary [of the Department of Interior] for release [outside the current range of such species] . . . ."(16 USC § 1539(j)(1)). A member of an experimental population will not be treated as a threatened species, unless it occurs in the National Wildlife Refuge System or a National Park System, if it is determined "to be not essential to the continued existence of a species" under section 10(j)(2)(B) (16 USC. § 1539(j)(2)(C)(i)). Because such X/N species are only treated "as if" they are proposed to be federally listed threatened species, they do not yet rise to this status of threatened or endangered, except in National Parks or National monuments where M-44 use already is prohibited under EPA Use Restriction 8. The NRM gray wolf has been designated under ESA section 10(j) as an X/N population, except in NW Montana and the panhandle of Idaho north of I-90), and proposed as a Distinct Population Segment in the following areas: the eastern ⅓ of Washington and Oregon, a small part of north-central Utah, and all of Montana, Idaho, and Wyoming (Federal Register 71:26:6634-6660).

[2] Wolves south of I-90 in Idaho are not federally listed threatened or endangered species but are part of the X/N population.

[3] Idaho-WS relies on information provided by the Idaho Department of Fish and Game (IDFG) and the Nez Perce Tribe to determine occupied gray wolf range. M-44 devices may be used in gray wolf range on a case-by-case basis, after Idaho-WS personnel have contacted the IDFG and/or the Nez Perce Tribe's wolf recovery coordinator and received updates on the most current gray wolf map, radio-telemetry information, visual sightings, and other evidence that would indicate wolves have not been recently present in the area and would not likely be adversely affected by M-44 use. Following this, Idaho-WS personnel will notify the USFWS and the IDFG of proposed M-44 use and receive USFWS concurrence, if justified. On January 31, 2007, two wolves were found dead in the X/N area near M-44 devices that had been set to control depredating coyotes. The WS Specialist who placed the M-44s complied with USFWS requirements to reduce the likelihood of a non-target take as well as all applicable EPA regulations. IDFG, USFWS Law Enforcement and the Idaho Department of Agriculture were immediately notified of the incident.

4 Montana WS consults with the USFWS and monitors/surveys an area before M-44s are set. Montana WS continues to consult with the USFWS prior to setting M-44s within the X/N area. In addition, WS also consults with the Montana Fish, Wildlife and Parks Department (MFWP) prior to setting any M-44s and has increased survey procedures to included not only track surveys, hair/fence line surveys, scat surveys, but also howling surveys and radio-telemetry surveillance of known packs; there are many more radio-collared packs now and MFWP routinely flies surveillance flights to document where the packs are located.

Gray wolves have expanded their range, with the exception of the Mexican wolf. Following the introduction of gray wolves into the NRM Region, this population expanded rapidly (Figure 1). At the end of 2000, the NRM gray wolf population in the Greater Yellowstone Area (GYA) and central Idaho met its numerical and distributional recovery goal of a minimum of 30 "breeding pairs" and more than 300 well-distributed wolves in Montana, Idaho, and Wyoming (68 FR 15804, April 1, 2003). This population of gray wolves has surpassed the goal since 2000 and the FWS issued a Federal Register Notice on February 27, 2008, delisting the NRM population of gray wolves (73 FR 10514-10560). Wolf populations can more than double in two years if mortality is reduced and food is available (Fuller et al. 2003). Increases of nearly 100%/yr have been documented in low-density areas of suitable habitat (FWS et al. 2007). Wolf populations can remain stable

with human-caused mortality ranging from 30% to 50% (Keith 1983, Fuller et al. 2003). Given adequate prey, wolf populations can sustain high levels of human-caused mortality due to their high reproductive potential and dispersal into vacated areas (Fuller et al. 2003).

The interagency working group for NRM gray wolf reintroduction is composed of federal, state, and tribal agency personnel, including APHIS WS. The working group conducted four basic recovery tasks, in addition to the standard enforcement functions associated with the take of a listed species. These tasks were: 1) monitor wolf distribution and numbers[6] (Figure 1); 2) control wolves that attacked livestock by moving and other nonlethal measures, or by killing them; 3) conduct research on wolf relationships to ungulate prey, other carnivores, scavengers, livestock, and people; and 4) provide accurate science-based information so that people can develop opinions about wolves and wolf management from an informed perspective. APHIS WS' partnership with the FWS and state agencies to support gray wolf conservation includes operational management activities in ID, MI, MN, MT, WI, and WY. During FY2006, a total of 278 gray wolves were taken by APHIS WS; 2 individuals (0.7%) were nontargets (a single wolf with an M44, noted in Table 8, and a single wolf with a snare), and 276 were intentionally taken pursuant to agreements and interagency programs. The NRM gray wolf population's high annual growth rate and its expanding range have resulted in the FWS determination that it has exceeded its biological recovery goals, and that all threats in the foreseeable future have been sufficiently reduced or eliminated. The Northern Rocky Mountain gray wolf DPS was delisted in February, 2008 (73 FR 10514-10560). The FWS and state agencies value WS involvement in gray wolf reintroduction, conservation, and damage management programs because it increases overall public acceptance of wolves by reducing negative impacts to agriculture and other resources of value to the public.

APHIS WS does not use M-44s or LPCs in occupied wolf areas unless the FWS has concurred, on a case-by-case basis, that such use would be unlikely to adversely affect gray wolves. APHIS WS personnel who work in or adjacent to a wolf recovery area have access to telemetry data and the telephone number for the local FWS/state management agency office. Before APHIS WS utilizes M-44s within the wolves' range but where wolves are not known to occupy a specific area, APHIS WS does three surveys[7] looking for any sign of wolves, tracks or scat as well as howling surveys and telemetry if a pack member is radio-collared. APHIS WS personnel receive training on wolf sign identification. APHIS WS notifies FWS or the state management agency about the location of a PDM activity to determine if they know of any wolf activity in the immediate or surrounding area. APHIS WS does not use M-44s at any time in known occupied wolf areas to minimize potential wolf take.

Despite these efforts to avoid take with an M-44 or any other method, wolves have unknowingly dispersed or been present in areas where APHIS WS has been requested to provide service, livestock are present, and wolves have found and pulled an M-44 and have been killed (Table 8). On average, APHIS WS has killed less than one wolf per year during the last 13 years and this take has not hampered wolf recovery or population viability (Figure 1). APHIS WS and FWS discuss each incident and possible ways to avoid future incidents. As a result of taking a dispersing wolf in an area where a wolf was not anticipated, APHIS WS initiated a Section 7 consultation and received a BO from FWS (2004) for wolves in North Dakota. These wolves likely came from the eastern timber wolf population in Minnesota.

In conclusion, APHIS WS has taken very few wolves with M-44s and has made adjustments to reduce potential take. All but two wolves killed with M-44s came from the NRM X/N populations which has exceeded the minimum numerical and distributional recovery goals for at least seven consecutive years.

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6 Dispersing wolves may cover large areas as lone animals as they try to join other packs or attempt to form their own pack in unoccupied habitat. Dispersal distances in the NRM average about 60 miles (mi), but dispersals over 500 mi have been documented.

7 APHIS WS personnel document the date when each survey was done and where the survey was done and the results (*i.e.*, any tracks or scat, responses to howling, signals from radio collars, and personal conversation with responsible management agency).

These wolf populations have achieved the biological criteria necessary for a viable and recovered wolf population, so day-to-day wolf management has been relinquished to the state wildlife management agencies in Idaho and Montana, and the Final Rule establishing the delisting of the NRM gray wolf population was published in February 2008. APHIS WS incidental take of wolves by use of M-44s has not adversely affected NRM gray wolf recovery. Also, APHIS WS has not incidentally taken any Mexican gray wolves with M-44s, LPCs, or any other method. Therefore, APHIS WS use of M-44s and LPCs has not adversely affected listed or experimentally reintroduced populations of the gray wolf.

**Grizzly Bear**

There are no conclusively-documented records of APHIS WS taking a grizzly bear with an M-44 or LPC. There has been a claim that a grizzly bear was killed by an M-44 in 1998 near Helmsville, Montana, however, the FWS investigation showed that no conclusive evidence existed to determine the cause of death (G. D. Domenici, FWS, Resident Law Enforcement Agent in Charge for Montana and Wyoming, memorandum to D. J. Hayes, APHIS WS, December 4, 2007).

In the lower 48 states, grizzly bears can be found in Wyoming, Montana, Idaho, and Washington. On March 22, 2007, the FWS announced that the GYA Distinct Population Segment (DPS) had recovered and no longer met ESA's definition of a T&E species. This population has increased from estimates as low as 136 individuals in 1975 to more than 500 animals as of 2006, an annual increase of 4-7%. Additionally, there has been a 48% increase in occupied habitat since the 1970s. At present, about 84-90% of females with cubs occupy the Primary Conservation Area (PCA) and about 10% of females with cubs have expanded out beyond the PCA within the DPS boundaries in the GYA. Grizzly bears now occupy 68% of suitable habitat within the DPS boundaries and may soon occupy the remainder of the suitable habitat (http://www.USFWS.gov/ mountain-prairie/species/mammals/grizzly/yellowstone.htm).

Monitoring of the population and its habitat by FWS and state wildlife agencies[8] will continue so managers can base management decisions on the best available scientific information. The GYA DPS represents a viable population which has sufficient numbers and distribution of reproductive individuals so as to provide a high likelihood that the species will continue to exist and be well distributed throughout its range for the foreseeable future. Therefore, based on the best scientific and commercial information available, the FWS is finalizing the delisting of the GYA grizzly bear DPS. More information on this action and other post-delisting management documents are available at (http://www.USFWS.gov/mountain-prairie/species/mammals/grizzly /yellowstone.htm).

The grizzly bear could potentially be affected by both the M-44 and LPC. APHIS WS abides by the Reasonable and Prudent Measures and Alternatives to reduce potential impacts to the grizzly that are contained in USDA (1997 Appendix F). Examples of minimization measures include: 1) APHIS WS receives updated information at least annually on areas where grizzly bears may occur, 2) LPCs are not used in those areas if the FWS determines that their use might adversely affect grizzly bears, and 3) WS does not set M-44s in areas thought to contain grizzly bears, with the exception that some use may occur during the Dec. 1 - March 1 time frame when grizzly bears would be expected to be in hibernation. APHIS WS has not had an impact on the grizzly bear and finds that the measures to preclude jeopardy to the species have been effective.

8 The state and federal agencies are committed to implementing the extensive Conservation Strategy and State management plans. They have formally incorporated the habitat and population standards described in the Conservation Strategy into the six affected National Forests' Land Management Plans and Yellowstone and Grand Teton's National Park Compendiums. This commitment coupled with State wildlife agencies' approved grizzly bear management plans ensure that adequate regulatory mechanisms are in place and that the Yellowstone grizzly bear population will not become an endangered species within the foreseeable future throughout all or a significant portion of its range.

**California Condor**

There are no conclusively-documented records of APHIS WS taking a California condor with an M-44 or LPC. In 1983, though, an incident was investigated where a condor was alleged to have been killed in California by an M-44, but conclusive evidence was not found for the cause of death[9].

The California condor was listed as endangered on March 11, 1967 and the FWS designated critical habitat for the California condor in California on September 24, 1976 (41 FR 41914). Using captive reared birds, condor reintroduction was initiated in 1992 in California and 113 California condors being released into California since. Seven California condors were also released in the Vermilion Cliffs Experimental Population Area located in parts of Arizona, Utah, and Nevada (61FR 54043-54060 October 16, 1996). In 2002, three condors were also released in Baja California, Mexico. In August 2005, there were 125 condors in the wild: 55 in California, 55 in Arizona, and 13 in Baja California. The total condor population (captive and free-flying) was 289 birds in 2007.

In the experimental population area[10, 11], California condors have the status of an X/N population and are considered proposed for listing under the ESA, except within areas administered by the National Park and National Wildlife Refuge System, where they are endangered. Also, any condor that leaves the X/N population area is considered endangered. In the event that a condor moves outside the X/N area, the condor is to be captured and returned to the experimental area, or placed in a captive breeding facility. The 10(j) special rule includes provisions for the capture and return of condors to the X/N population (61FR 54043-54060 October 16, 1996).

Concern has arisen about the potential of the M-44 to affect condors in the reintroduced populations, especially those that venture out of the projected experimental ranges into other states, which could potentially include states that are distant from the release site. To our knowledge, the movement of a condor outside the experimental zone has only occurred one time. In 2000, a condor left the Vermillion Cliffs experimental area and traveled north through Utah into southern Wyoming and returned to the experimental area. A lawsuit was filed by several environmental groups claiming that APHIS WS violated M-44 Use Restriction #9. Due to the litigation filed by the environmental groups following this incident, a joint stipulation was agreed upon in the U.S. District Court by APHIS WS and the litigants in April 2000. As part of the joint stipulation to preclude impacts to California condors outside of the X/N population area, APHIS WS agreed not to set M-44s within 5 miles of the Colorado, San Juan and Green Rivers between March 1 and October 31, not set M-44s within 1000 feet of each other, and set M-44s so they are not visible, and do not protrude above ground level. No condors have been reported in this area since.

The California Condor Recovery Coordinator with FWS communicates closely with APHIS WS regarding known location of condors. Should a condor be seen outside its range in California or Arizona-Utah, APHIS WS would initiate the reasonable and prudent alternatives outlined in the 1992 FWS BO (USDA 1997) in the newly occupied area. The FWS BO found jeopardy for the condor in its natural range, but anticipated that APHIS WS would not take a California condor following the reasonable and prudent alternatives and, therefore, did not issue an incidental take.

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9 The investigation did not prove conclusively that the condor had actually pulled one, but only that it had some fluorescent particles in the mouth that appeared similar to the Tracerite (*i.e.*, fluorescent particles) used in sodium cyanide capsules at the time.

10 In accordance with a special rule issued under section 10(j), throughout the entire California condor experimental population area, "*you will not be in violation of the ESA if you unavoidably and unintentionally take (including killing or injuring) a California condor, provided such take is non-negligent and incidental to a lawful activity, such as hunting, driving, or recreational activities, and you report the take as soon as possible*."

11 No operational restrictions due to the presence or potential presence of California condors are placed on permitted activities on Bureau of Land Management (BLM) grazing allotments located in proximity to the release site at the Vermilion Cliffs (61FR 54043-54060 October 16, 1996).

Predator management will likely have a positive effect on the California condor. The number one predator of condors is the coyote, and predation management targeting coyotes for the protection of livestock and wildlife would have a positive effect, especially with mitigation measures in effect. It is APHIS WS's conclusion that M-44s and LPCs may effect, but are *not likely to jeopardize* the condor following the reasonable and prudent alternatives from the BO (USDA 1997).

**Canada Lynx**

There are no conclusively-documented records of APHIS WS taking a Canada lynx with an M-44 or LPC. APHIS WS does not use the M-44 or LPC in areas occupied by lynx, and, therefore, APHIS WS does not believe it will have an adverse impact on the population. Lynx are found in several areas of the United States, including Maine, Idaho, Montana, and Wyoming. Recently, just prior to their listing, lynx were reintroduced into the southern Rocky Mountains in Colorado from lynx captured in Canada and Alaska. This population has been increasing in size since its reintroduction.

The M-44 and LPC have the potential to both adversely affect and benefit lynx. APHIS WS abides by an APHIS WS interim policy or state specific BOs that minimizes the likelihood of taking a lynx. APHIS WS has currently limited WDM activity in known lynx occupied areas per the interim policy including limiting the use of M-44s and LPCs. APHIS WS consulted under Section 7 of the ESA with FWS in 15 states and received BOs for lynx in Colorado and Utah (FWS 2005b), southern Idaho (FWS 2002), and Wyoming (FWS 2007). APHIS WS in Montana is currently in a Section 7 consultation. APHIS WS received incidental take statements, but has not taken a threatened lynx. APHIS WS does not use the M-44 or LPC in "lynx-occupied" habitats. APHIS WS monitors areas for lynx sign to ensure lynx are not in the area. In Colorado, since many of the lynx are radio-collared, locations of the lynx are given to APHIS WS personnel to provide information on their locations. APHIS WS abides by the Reasonable and Prudent Measures and Alternatives and Terms and Conditions of these BOs or the APHIS WS interim policy to avoid take and, therefore, we believe that potential impacts will at most be minimal.

On the other hand, predation management activities may be beneficial for lynx. Buskirk et al. (1999) described the two major competition impacts to lynx as exploitation (competition for food) and interference (avoidance). Of several predators examined, coyotes were deemed the species most likely to pose local or regionally significant exploitation impacts to lynx; additionally, coyotes and bobcats were deemed to possibly have important interference competition effects on lynx. Coyotes have greatly expanded their winter range in some cases throughout the United States because they can now use snow-packed trails and plowed roads, to gain access into lynx winter habitat areas where deep snows previously hindered their ability to move into and occupy such areas (USDA 2004). The benefits of removing coyotes from Canada lynx habitat may outweigh any potential for negative impacts on the lynx by reducing direct competition for prey, predation of lynx kittens, and avoidance of certain areas by lynx due to the presence of coyotes.

**Jaguar**[12]

The jaguar range in North America includes Mexico and portions of the southwestern United States. The historical range of the jaguar included portions of Arizona, New Mexico, and Texas. The current range is from central Mexico through Central America and into South America as far as northern Argentina. It is considered that the United States no longer contains established breeding jaguar populations which probably disappeared in the 1960s. FWS (1990) recognized that the jaguar continues to occur in the American Southwest as an occasional wanderer from Mexico.

12 Except for occasional wanderers from Mexico, the jaguar can be considered extirpated from the United States.

There are no conclusively-documented records of APHIS WS taking a jaguar with an M-44 or LPC. As a result of implementing measures to minimize the potential for take as per the BO and its amendment (USFWS 1999a, 1999b) APHIS WS believes that only minimal potential exists for such an occurrence. APHIS WS will continue to abide by the Reasonable and Prudent Measures and Terms and Conditions of the June 22, 1999 BO, including providing the FWS annual reports of activities in occupied range and occupied habitat as defined in the BO. APHIS WS, in coordination with FWS, mapped out areas in Arizona and New Mexico where the jaguar could potentially be found, and M-44s and LPCs are not used in these areas. There is little or no sheep or goat production in these areas, which means there is no expected need to use LPCs in occupied jaguar range in the foreseeable future. The restrictions and measures established through consultation and coordination with the FWS are believed to be adequate to prevent adverse effects on the jaguar from use the M-44 or LPC.

**Ocelot**[13]

The ocelot can occur in extreme southeastern Texas and could potentially wander into Arizona from Mexico (FWS 1990). Ocelots continue to occur in south Texas on about 50,606 acres of public and private land. Estimates of their numbers range from 12 to 66 animals and they are threatened by habitat destruction and killing as unwanted predators. None have been killed by APHIS WS. The population is still viable and is known to breed within its restricted range. In Texas, the ocelot is protected by state law and receives state endangered species status. In Arizona, the ocelot has been protected by order of the Arizona Game and Fish Commission since 1970.

There are no conclusively-documented records of APHIS WS taking an ocelot with an M-44 or LPC. WS does not conduct predation damage management activities with M-44s or LPCs in habitat potentially occupied by ocelot in Texas, and follows all Reasonable and Prudent Measures and Alternatives of a BO (FWS 1997). If APHIS WS encounters sign elsewhere, FWS will be notified and PDM activities that have the potential to affect the ocelot will be stopped as long as the area is occupied by an ocelot. Therefore, APHIS WS M-44 or LPC use is not expected to have any adverse effects on the ocelot.

**Jaguarundi**

There are no conclusively-documented records of APHIS WS taking a jaguarundi with an M-44 or LPC. The jaguarondi is only found in south Texas. APHIS WS conducted a Section 7 consultation with FWS for the jaguarundi which was included with the ocelot (USFWS 1997). APHIS WS does not use the M-44 or LPC in habitat potentially occupied by the jaguarundi, and, therefore, take is not anticipated.

**Louisiana Black Bear**

There are no conclusively-documented records of APHIS WS taking a Louisiana black bear with an M-44 or LPC. APHIS WS conducted a Section 7 consultation with FWS on the Louisiana black bear and was given an incidental take statement (USDA 1997, FWS 2001). APHIS WS does not use the M-44 or LPC in areas occupied by the bear, and, therefore, APHIS WS does not anticipate any take.

**San Joaquin Kit Fox**

There are no conclusively-documented records of APHIS WS taking a San Joaquin kit fox with an M-44 or LPC. The San Joaquin kit fox is an endangered subspecies of the kit fox (occurs only in California) and was discussed in the 1992 USFWS BO (USDA 1997) and, in accordance with use-restrictions and the BO, APHIS WS does not use M-44s or LPCs in their range. M-44s and LPCs are only allowed for limited use

13 Only the ocelot has been regularly documented recently in the United States.

in California on tribal lands that are not subject to state jurisdiction. Therefore, APHIS WS's M-44 or LPC use is not expected to adversely affect this species.

**Black-footed Ferret**

There are no conclusively-documented records of APHIS WS taking a black-footed ferret with an M-44 or LPC. Black-footed ferrets, a federally listed endangered species, were once found in west central United States in prairie dog colonies, as prairies dogs are their principal food source. The last ferret population was found in 1981 in Meeteetse, Wyoming and is now believed to be extirpated in the wild. Since that time, ferrets have been reintroduced in X/Ns in several states. One of the 26 Use Restrictions for M-44s specifies that they cannot be used in prairie dog colonies, one of the 26 use restrictions, and, therefore, FWS did not consider M-44s to have a potential impact on the species. APHIS WS has not taken a black-footed ferret and does not anticipate such an occurrence.

**Other Species**

**Bald Eagle**

APHIS WS use of M-44s resulted in the nontarget take of one bald eagle in FY03 and one in FY05. Both were allowed by APHIS WS's incidental take authorization from FWS, but APHIS WS worked with FWS to identify the problem. A BO and amendment was issued to (FWS 2004, 2005a) and APHIS WS in North Dakota where both eagles were taken. Livestock Protection Collar use has not resulted in any incidental take of bald eagles. APHIS WS use of M-44s and LPCs is not expected to have any adverse effect on bald eagle populations.

The bald eagle was delisted in 2007 because the best available scientific and commercial data indicate that the bald eagle has recovered[14] (Fed. Reg. 72(130): 37346-37372). Therefore, under the authority of the ESA, the FWS delisted the bald eagle in the lower 48 States of the United States from protection of the ESA on July 9, 2007.

**Swift Fox**

APHIS WS use of M-44s has resulted in the nontarget take of an average of 14 swift fox each year during the period FY 1996- FY 2006 (Table 3). APHIS WS LPC use has not resulted in any take of swift fox. To put the 14 taken by APHIS WS in perspective, licensed trappers in Colorado harvested an average of 300 swift fox annually from 1987 to 1994 at which time the season was closed as this species became a species of concern throughout most of its range.

The swift fox is a species of concern that was considered for listing, although its population is considered stable to increasing in most parts of its range. It recently has been reintroduced to several areas in its historic range including South Dakota and Canada. The U.S. Department of Interior (USDI) (1995) determined that the most immediate threat to the survival of the swift fox was coyote predation. In western Kansas, direct predation by coyotes was the major cause of mortality for adult and juvenile swift foxes in both cropland and rangeland study areas (Sovada, et al. 1998). Thus, a local reduction in coyote abundance from predation management would potentially benefit the swift fox population. Adverse impacts from limited incidental take of this species in predation management activities are, therefore, probably outweighed by the beneficial effects of local reductions in coyote abundance. Therefore, WS use of M-44s and LPCs is not expected to have any significant adverse effect on swift fox.

14 Protections provided to the bald eagle under the Bald and Golden Eagle Protection Act (BGEPA) and the Migratory Bird Treaty Act (MBTA) continue to remain in place.

**Kit Fox**

APHIS WS LPC use has not taken a kit fox. APHIS WS use of M-44s has resulted in the nontarget take of an average of 12 kit fox each year during the period FY96-FY06 (Table 3). This is a minimal number compared to their estimated populations in the various states where they are found. To put this number in perspective, an estimated 500 kit fox are harvested annually in just the state of Arizona alone. APHIS WS nontarget take of kit fox with M-44s is considered minimal. APHIS WS use of M-44s and LPCs is not expected to have any adverse effect on kit fox populations.

The kit fox is a species of concern in states on the periphery of its range such as Colorado and Oregon. This species prefers areas where the soils are loose-textured and where they can dig underground dens which are used throughout the year (O'Farrell 1999, Scott-Brown et al. 1999, Biota Information System of New Mexico 2008). The kit fox is considered fairly common, especially in areas that support large populations of prey such as kangaroo rats, deer mice, birds, and insects.

**Ringtail**

APHIS WS took an annual average of four nontarget ringtails with M-44s from FY96 to FY06. Ringtails are considered common in appropriate habitat and have been found at densities of 0.2/mi$^2$ to 51.8/mi$^2$ (Kaufmann 1999). Few are harvested by sportsmen with an average harvest of less than 100 annually in many states. For comparison to APHIS WS's take, over 4,000 were harvested in the 1981-82 and 1987-88 seasons; take has been minimal since because fur prices declined and a trap ban initiative was passed (Arizona Game and Fish Department 2007). APHIS WS take of 4 annually is 0.1% of the potential harvest in Arizona alone, thus we believe that impacts by APHIS Ws have been negligible to ringtail populations.

The ringtail is found in southwestern states in rimrock, desert, and rocky ridge habitats in close association with water. Ringtails feed on small mammals, birds, lizards, insects, and mast. They are a species of concern in Oregon where scattered local populations exist.

**Relationship of Predator Removal and the Public's Aesthetic Values of Predators**

Wildlife is generally regarded as providing economic, recreational, and aesthetic benefits (Decker and Goff 1987), and the mere knowledge that wildlife exists is a positive benefit to many people. Some members of the public have expressed concerns that predation management could result in the loss of aesthetic benefits to the public, resource owners, or local residents. Aesthetics is the philosophy dealing with the nature of beauty, or the appreciation of beauty, and it is subjective in nature, dependent on what an observer regards as beautiful.

APHIS WS predation damage management activities occur on a relatively limited portion of the total area in any state where APHIS WS conducts predation management (generally less than 10% of the land acreage in a state), and the portion of various predator species' populations removed through APHIS WS activities is a low percentage, usually less than 5%. In localized areas where APHIS WS removes some portion of the predator population, dispersal of predators from adjacent areas typically contributes to repopulation of the area within a few weeks to a year, depending on the level of predator removal and predator population levels in nearby areas. Most of the species potentially affected by APHIS WS predation management activities are relatively abundant, but are not commonly observed because many of these species are secretive and nocturnal. Opportunities for observing or hearing certain predator species in some localized areas could be temporarily reduced as a result of APHIS WS' PDM, but because there is already a low likelihood of seeing a predator, this temporary local reduction in public viewing opportunity would not likely be noticeable in most cases. The impact of APHIS WS predation management on overall predator populations is minimal.

The GAO (1990) recognizes that APHIS WS directs their efforts at individual offending animals or local populations of predators, and is not focused on eradication of statewide predator populations. Further, GAO (1990) asserts that WS take of predators is small compared to statewide populations and the number of predators removed by hunters and trappers, and concluded that APHIS WS predator management activities to protect livestock do not threaten predator populations in the 17 western states.

APHIS WS believes that aesthetic appreciation would not be impacted, and opportunities to view, hear, or see evidence of predators would still be available over the vast majority of land areas of the states since APHIS WS conducts predation management on a small proportion of land area, and often on private property where the public would not typically occur or interact with wildlife.

## 2.0 Relationship Between Product Use and Human and Pet Health and Safety

The use of the M-44 and LPC by APHIS WS is regulated by EPA under the Federal Insecticide and Rodenticide Act (FIFRA), state agency Pesticide Laws, and APHIS WS Policies and Directives, and does not pose a significant potential hazard to APHIS WS employees, the public, domestic dogs, or the environment. A detailed risk assessment analyzed predation management methods used by APHIS WS for their risks to WS employees, members of the public, nontarget animals including pets, and found low level risks associated with only a few of them (USDA 1997, Appendix P). While some of the materials and methods used by APHIS WS have the potential to represent a threat to health and safety if used improperly, problems associated with their misuse have rarely occurred. APHIS WS' training and certification programs for the use of M-44s and LPCs, and the fact that these methods are typically applied in areas of very low human population density, further reduce the potential for risk. Warning signs are prominently posted to alert the public when these products are deployed. APHIS WS coordinates with cooperating landowners regarding placement of the devices, thereby decreasing the likelihood of conflicts with the public. Despite these precautions, unintended adverse incidents have occurred with the M-44 and LPC, and they are discussed.

APHIS WS records include 39 reported human exposures to sodium cyanide via the M-44 during 1978-2007, a rate of approximately 1.3 exposures per year (Table 9). None of these incidents resulted in death, and most involved minor or short-term symptoms. Twenty four of these incidents (62%) involved APHIS WS employees, and 15 (38%) involved the public over the 40-year period. APHIS WS has followed all the use restrictions in the situations where private citizen exposures occurred. Many of the incidents that involved exposures to members of the public resulted from the involved individual's disregard of warning and trespass signs or intentional tampering with the devices. These incidents have all previously been reported to EPA via 6(a)(2) Adverse Effects Incident Information Reports.

**LPC/Compound 1080 Adverse Human Incidents (FIFRA 6(a)(2)) for 1978 through 2007**

No human exposures to the contents of a Livestock Protection Collar were reported during the time covered in this analysis.

**LPC/Compound 1080 Adverse Incident Report – Domestic Dog**

APHIS WS records indicate that only one adverse incident involving a domestic dog and Compound 1080 from an LPC occurred. In this case (2004, New Mexico), a cooperating rancher's dog was exposed to sheep wool that contained Compound 1080, and dies. The wool was being transported for disposal in a box in the bed of a truck, and the dog jumped into the bed of the truck and consumed the wool. The incident did not occur during field use of LPCs and did not result in an environmental release of the toxicant. The record for LPC use indicates that risk to domestic dogs is negligible.

**M-44 Adverse Human Incident Reports (FIFRA 6(a)(2)) for 1978 through 2007**

There have been no human deaths resulting from M-44-related cyanide exposures from APHIS WS use, and there does not appear to be any definitive evidence that any of the exposures have been the cause of any long-lasting adverse health effects.

From 1978 to 2007, there are 39 records of people accidentally exposed to sodium cyanide via the M-44 (Table 9, Appendix 10), in the following states ID (2), ND (1), NE (2), NM (9), OK (2), OR (3), TX (13), UT (5), and VA (2). None of the exposures resulted in death. One record was not included in this analysis because it involved a suicide attempt by a terminally-ill individual. Because M-44s are set mostly in rangelands and pastures, these were the only use sites associated with the incidents. On average, 1.3 accidental human exposures to sodium cyanide were reported per year during this 30-year period, with 0-1 incident reported for twenty of those years (Table 9). The majority of the exposures (62%) involved APHIS WS employees as they set, maintained or removed the devices. The other 38% of the exposures involved the public. Circumstances around general public exposures were more diverse than those involving APHIS WS employees and included intentional tampering, trespassing, accidental discharge, and human contact in association with a dog pulling the M-44. APHIS WS use of the M-44 is closely regulated by the EPA and state pesticide management programs/agencies, and includes a series of use restrictions described earlier (Appendix 5). Property owners or managers must be informed when M-44s are placed on their property. APHIS WS obtains signed agreements from private property owners/managers before placing M-44s or any other damage management equipment on private property. In all but two cases, APHIS WS had properly posted the presence of the devices with the required signs.

In June 1998, EPA published clarifying guidance on identifying and reporting incidents, which resulted in greater reporting after August 17, 1998. The Final Rule (62 FR 49370) and subsequent EPA clarifications broadened previous interpretations and increased reporting since it included knowledge/reports from agents and contractors (no longer only from registrants), and required reporting of information from earlier years that had not previously been required. The 1998 guidance provided a more clear definition of adverse incident, and it defined six categories of reportable incidents involving humans, domestic animals, livestock, wildlife, and plants. It also included categories for poor product performance, property damage, and research results. The highest number of M-44 incidents in one year was reported in 1999, the first full year following EPA's enhanced reporting guidance. Therefore, the post-1999 data reflects more systematic and thorough reporting.

Symptoms reported from sodium cyanide exposure were transcribed directly from APHIS WS incident reports or from correspondence that resulted from an alleged exposure (Appendix 10). In only a few cases were the symptoms verified by a physician. Symptoms expressed as a result of exposure were related to the degree to which people came in contact with sodium cyanide. Some of the symptoms reported in the incident reports were indicative of a panic response, and it is difficult to determine if these symptoms were caused by panic or exposure to sodium cyanide.

**APHIS WS Employee Exposures**

APHIS WS employees were involved in 24 (62%) of the sodium cyanide exposure incidents during this 30-year period. In seven of the 13 incidents where the circumstances could be determined, the sodium cyanide exposure occurred while the employee was installing, removing or maintaining the device. Most commonly, the employee did not exercise proper safety procedures while working with the device. Two employees reported the device discharged without any apparent mechanical activation. Two incidents occurred as the employee attempted to drain water or chip ice from the depression in which the device was set. One incident occurred when an employee bumped an M-44 with a stick used to push brush aside while searching for the

device. In one case, the employee transported a loaded M-44 in a bucket in the back of a truck, where it discharged.

The severity of the symptoms APHIS WS employees' experienced following exposure to sodium cyanide varied greatly. Where it could be determined, six incidents could be considered indirect exposures and symptoms included eye irritation and report of a bitter taste in the mouth. In seven cases, sodium cyanide was discharged directly into the face of the employee. In these cases, employees reported nausea, muscle tightness, chest pains, blurred vision, and first and second degree chemical burns to the eye. APHIS WS employees are required to have an amyl nitrate antidote kit on their person while working with the M-44. Nine (36%) of the employees exposed reported using the antidote kit. Nine (36%), sought medical treatment after being exposed.

**Private Citizen Exposures**

The following information is based on APHIS WS investigations of incidents involving public exposure to M-44s. During this 30-year period, 15 (38% of the 39 human exposures) private citizens reported being exposed to sodium cyanide as a result of an M-44 discharge (Table 9). Four of the incidents were reported to involve trespassing onto private property. Six exposures occurred while the person intentionally tampered with the device. Five of the exposure incidents were the result of the M-44 being discharged accidently. Four exposures were the result of a dog pulling the device and subsequent human exposure, none of which resulted in a human fatality.

Pronounced symptoms were reported for six incident reports, and involved symptoms such as burning eyes, blurred vision, increased respiration, and increased heart rate. Because the circumstances around these incidents are unique, they are discussed separately.

- (Oregon, October 1994). A person reported being exposed when she attempted to administer first aid to her dog after it had pulled an M-44. The person reported inhaling deeply near the dog's muzzle to detect any unusual odor, and she was bitten in the hand by the dog as she attempted to clear the dog's airway. At least 15 minutes passed before she experienced rapid heart beat, light headedness, nausea, tunnel vision and near fainting. She reported that she realized that these symptoms might have simply been caused by the panic associated with not knowing what she was exposed to. She called 911, but did not receive medical attention. Over the next few months she reported experiencing a metallic taste, abnormal heart beat, insomnia, tingling and numbness in the limbs.

- (New Mexico, June 1990). A ranch hand reported being exposed when his free-running dog pulled an M-44 and immediately ran over to the ranch hand and made mouth-to-mouth contact (not rescue breathing) with the person before the dog died. Within a few minutes the person reported feeling ill and proceeded to flush his mouth, nose and eyes with water. He reported experiencing loss of breath, rapid heart rate, and other pronounced symptoms. Paramedics administered amyl nitrate (supplied by the APHIS WS Specialist) and transported him to the hospital where he was given more amyl nitrate and admitted for overnight observation. He was released the next morning.

- (Nebraska, January 2002). An owner of a ranch on which M-44s were set reported placing a concrete block on an M-44 in an attempt to protect bird dogs that were expected in the area. The M-44 discharged and sodium cyanide struck him the left eye and face. He reported cloudy vision. After washing his eyes and face with water, he went to the hospital where further eye washing occurred. He was then released.

- (New Mexico, November 2002). A person reported being exposed to sodium cyanide when an M-44 discharged into her hand. After watching the APHIS WS employee check his M-44 sets, this person intentionally (admitted to ignoring the warning signs) trespassed on to private land with the intention of removing the M-44. She protected her hand with a latex glove and placed a garbage bag over the M-44 to remove the device. When the M-44 discharged, she reported that a vapor drifted out of the bag and she felt a short-term slight burning to her eyes and her breathing rate increased. She was checked at the hospital and showing no symptoms, was released.

- (Texas, May 2007). A mosquito control worker reported setting off an M-44. This person was reportedly trespassing on private property when he reported intentionally kicking on an M-44 (properly marked with a warning sign). Sodium cyanide was reported to go into his eyes. He reported being disoriented and experienced a burning sensation in his eyes. He received medical attention from both Emergency Medical Services (EMS) personnel and hospital staff.

- (Utah, May 2003- Unconfirmed). In a widely publicized event, a person reportedly set off an M-44 in Utah while reportedly searching for arrowheads illegally on USDI Bureau of Land Management (BLM) land. The person reported dizziness, a headache, tingling lips, burning eyes and vomiting. While the complainant did not contact APHIS WS directly, APHIS WS received information about the complaint from BLM. While APHIS WS did not know the location of the alleged incident, an immediate investigation revealed that no M-44s had been fired. Later, an attorney representing the complainant contacted APHIS WS and informed them of the date and location of the alleged incident. M-44 devices were removed from the area 10 days prior to the date reported. Since there is not a private applicator M-44 program in Utah and no evidence to suggest that government devices were involved, the conclusion was that the event could not have occurred as reported. No 6(a)2 forms were filed since APHIS WS determined the facts to be false.

Minor symptoms were reported in four incident reports. Symptoms reported included a bad taste in the mouth, sunburn-like skin irritation, minor eye irritation, and general ill feeling. In two of these incidents, people reported having a bad taste in their mouths, but suffered no symptoms. In one incident, a hunter reported generally feeling bad after he accidentally bumped an M-44 and it discharged into his hand. In one incident, a person reported a 'sunburn-like' skin irritation after contacting his dog after it had pulled an M-44. This person reported that he did not wash his hands or face for 12 hours after the exposure and did not seek medical attention. This exposure could not be confirmed.

No symptoms were reported in five of the exposure incidents. In one case, a boy intentionally kicked an M-44. A cloud of sodium cyanide was reported to go over the boy's head when the unit discharged. He proceeded to dig the M-44 out of the ground and take it home. In this case, no symptoms were reported by the boy, his father or doctor. Two incident reports indicated the people had gotten sodium cyanide on their face or clothing, but no symptoms were reported. In the final two incidents it was doubtful that an exposure to sodium cyanide even occurred. One of these incidents involved possible intentionally striking the M-44 with a hoe. The other involved a person touching a dog after it pulled an M-44.

Although the record shows there have been some human exposure incidents over the years, such incidents have been infrequent considering the extent of M-44 use that has occurred. A majority of the exposures to members of the public that have occurred were associated with failure to observe or heed warning signs, or with illegal or inappropriate activities of the person involved such as trespassing, intentional tampering, or both.

**M-44 Adverse Domestic Dog Incident Reports (FIFRA 6(a)(2)) for 1967 through 2007**

During 1967-2007, there were 41 incidents (44 individual animals) involving domestic companion and working dogs and M-44s (Table 9 and Appendix 11). Many of the reports include cases where cyanide exposure of a domestic dog could not be confirmed. In a number of cases, there was no veterinary examination, no laboratory tests, or no animal carcass available for examination. Nonetheless, WS personnel submitted reports as required at the time of the incident. With the onset of improved EPA guidance, records from 1999 to 2007 provide the most useful information to characterize the circumstances of accidental exposure. From 1967 through 1998, there were ten domestic dog incident reports involving the M-44 device. From 1999 through 2007, 31 incidents involving 34 domestic dogs were identified. Most of this discussion will focus on these most recent eight years of reporting.

***Incidents Prior to 1999***

While most of the 10 domestic dog incidents prior to 1999 have too little information to adequately evaluate the causes, there is considerable information available on one incident that occurred in 1994 in Oregon. In this incident, the property lessee signed an agreement with APHIS WS to conduct predation damage management activities, including use of M-44s. USDA policy at that time specified that the lessee was responsible for notifying the property owner of the action. That notification did not occur in this case. The property owners were walking their dog on the property when the dog pulled an M-44 device and died. The required signs were placed at the entrance of the property used by APHIS WS, but the operator did not recognize that an alternate entrance existed. While a USDA investigation found no misuse in that case, the agency responded by 1) emphasizing to employees that all "apparent" property entrances are to be posted, and 2) implementing a formal agreement consisting of a signed form for property lessees that both reminds them of their obligation, and holds them responsible for notifying their landowner of M-44s in use on the property.

***Incidents from 1999 to 2007***

The 31 incidents involving 34 domestic dogs occurring from 1999 to 2007 usually involved one dog pulling a set M-44. Two of the reported 34 domestic dogs survived, and 32 died. Thirty operations were conducted on private property, and one on public land (BLM). Table 10 shows a general characterization of factors leading directly to the exposure of domestic dogs. The most common cause of unintentional exposure was due to willful disregard for laws and warnings by persons responsible for supervising dogs (45.2% of incidents resulting in 50% of animals exposed). Other unaccompanied free-roaming dogs (knowledge of ongoing M-44 operations by the dog owner is unavailable) was the second most common cause of dog exposure (32.3% of incidents). Each dog exposure incident is classified into categories.

- The most common factors in exposure to M-44s (14 incidents) were associated directly with willful disregard for laws or animal and human safety, such as violations of leash laws, trespassing, illegally running deer or bear, ignoring the required posted warning signs or prior notification by the property owner. These reported adverse incidents were completely preventable by the dog owners and other adults responsible for these animals at the time of the exposure. This category includes 14 incidents involving 17 domestic dogs, or 50% of dogs exposed from 1999 – 2007.

• The next most common factor (9 incidents) is dogs roaming unaccompanied by their owner or other person. The reports do not indicate if the dog owners knew of the device placements in many of these situations. In these nine incidents, dogs reportedly strayed onto adjacent property, or may have traveled several miles from home where they pulled an M-44. Many states or local jurisdictions have laws or ordinances that prohibit allowing dogs to run at large. However, we are unaware to what extent such laws were in place at the times

Table 9. Annual number of human and domestic dog exposures to sodium cyanide as a result of M-44 discharges from APHIS WS applications.*

| Year | WS Employee | Public Citizen | Total | | Pet Dog Incidents | Dogs (#) Involved |
|---|---|---|---|---|---|---|
| 1967-72 | - | - | - | | 3 | 3 |
| 1973-77 | - | - | - | | - | - |
| 1978 | - | OR | 1 | | - | - |
| 1979 | - | - | 0 | | - | - |
| 1980 | - | - | 0 | | - | - |
| 1981 | - | - | 0 | | - | - |
| 1982 | - | - | 0 | | - | - |
| 1983 | TX | - | 1 | | - | - |
| 1984 | - | - | 0 | | - | - |
| 1985 | - | - | 0 | | - | - |
| 1986 | - | - | 0 | | - | - |
| 1987 | TX | - | 1 | | - | - |
| 1988 | TX, NM | - | 2 | | - | - |
| 1989 | TX (3), ID, OK | - | 5 | | - | - |
| 1990 | NM | NM | 2 | | 1 | 1 |
| 1991 | TX, NM | - | 2 | | - | - |
| 1992 | ND | - | 1 | | - | - |
| 1993 | TX | UT, OR | 3 | | - | - |
| 1994 | TX | NM, OR | 3 | | 1 | 1 |
| 1995 | TX | ID | 2 | | - | - |
| 1996 | - | - | 0 | | - | - |
| 1997 | UT | - | 1 | | 1 | 1 |
| 1998 | - | - | 0 | | 4 | 4 |
| 1999 | NM, TX (2) | VA, UT, NE | 6 | | 9 | 12 |
| 2000 | - | UT | 1 | | 3 | 3 |
| 2001 | VA | - | 1 | | 2 | 2 |
| 2002 | NM | NE, NM | 3 | | 5 | 5 |
| 2003 | - | UT | 1 | | - | - |
| 2004 | - | - | 0 | | 4 | 4 |
| 2005 | NM | - | 1 | | 4 | 4 |
| 2006 | - | - | 0 | | 2 | 2 |
| 2007 | OK | TX | 2 | | 2 | 2 |
| Total | 24 | 15 | 39 | | 41 | 44 |

* APHIS WS has completed 6(a)(2) incident reports and submitted them to EPA previously.

and locations of these nine incidents.

- In 3 cases, the circumstances of an incident could not be determined.

- Two incidents occurred despite dog owners' efforts to prevent their dogs from going onto property where M-44 operations were being conducted. The dog owners were notified by their neighbors of the operation. The dogs were confined in some manner, but escaped and subsequently pulled an M-44.

- APHIS WS personnel were responsible for two unintentional misuses. In one case the employee complied with all the regulations, but inadvertently placed M-44s on the wrong property. In the second instance, the employee believed the amount of time allowed by state law for use of M-44 units in depredation situations was one month longer than the law actually allowed. In both cases, dogs pulled M-44 devices and died.

- One incident that occurred on public land managed by BLM resulted in exposure and death of a domestic dog. The proper warning signs were posted, but the dog owner did not see them.

Since domestic dogs are canids and thus one of the more susceptible animals expected to be at risk from M-44 use, it is noteworthy that relatively few accidental dog deaths occur considering the extent of use of this device. In the few incidents where mistakes have been made by APHIS WS employees that led to accidental domestic dog deaths, APHIS WS has taken steps to discipline and/or to further train personnel to avoid or further minimize the risk of further such incidents. Dog owners can help to reduce risks by taking more care to control their dogs to avoid running at large and trespassing, and by heeding warning signs. In comparison to some of the more common risks to domestic dogs such as the risk of death or serious injury from vehicle collisions on roads and highways, risks from M-44 device use would appear to be very minor. In 2004, the ASPCA's Animal Poison Control Center received approximately 95,000 calls relating to potential animal poisonings involving all types of materials. These calls range from suspected but unconfirmed exposures, to exposures resulting in animal deaths. Sixty one percent of these calls pertained to materials other than pesticides. In 2006, the APCC received 116,000 calls, and 78,000 involved common human drugs (ASPCA Press release March 5, 2007). Based on the record of accidental dog mortalities presented here, it appears that existing use restrictions and for M-44 use have been adequate to support a continued conclusion that the risk to domestic dogs is not unreasonable.

Table 10. Primary descriptors associated with domestic dog exposures to M-44s from 1999-2007.

| **Primary Descriptors Associated with Domestic Dog Exposure** | **Incidents** | **%of Incidents** |
|---|---|---|
| Willful disregard for laws and warnings including: Violation of leash laws, dog owner (or other persons) and dog trespassing on private property, illegally running deer or bear, ignoring warning signs or prior notification by the property owner, or a combination | 14 (17 dogs) | 45.2% (50% of dogs) |
| Domestic dogs roaming and unaccompanied – no report that dog owner was aware of M-44 operations | 9 | 32.3% |
| Circumstances of exposure unknown | 3 | 9.7% |
| Dog owner was aware of the M-44 operation and tried to protect the dog, but the dog escaped | 2 | 6.5% |
| Wildlife Services finding of misuse | 2 | 6.5% |
| Dog accompanied by owner on public land - owner did not see warning signs | 1 | 3.2% |
| TOTAL | 31 | |

**Corrections and Clarifications of the Petition's Description of M-44 Incidents:**

The following corrections and clarifications are submitted for four instances contained in the Petition.

**1. 1994 M-44 Incident in New Mexico (page 19 of Petition).** At the request of an outside organization, the New Mexico Department of Agriculture (NMDA) Bureau of Pesticide Management conducted an investigation and found potential problems due to differences in interpretation of M-44 use restrictions between NMDA and WS. New Mexico APHIS WS personnel were not cited for any pesticide violations, but licenses were held in abeyance until APHIS WS personnel attended a revised training course offered by NMDA. No fines were levied on APHIS WS, but APHIS WS agreed to pay $1000 to defray additional training costs. As a result, NM APHIS WS and NMDA worked on a mutual written interpretation of the use restrictions that are reviewed annually during internal Continuing Education Units (CEU) training attended by NM APHIS WS personnel. The New Mexico Department of Agriculture provided further guidance that M-44 use could not be conducted under the supervision of another licensed individual, which had been understood to be allowed previously in accordance with state pesticide law.

**2. 1999 M-44 Incident in New Mexico / Dogs (page 20 of Petition).** In December 1999, an incident occurred where two dogs were killed with M-44s in New Mexico. However, the incident occurred on private lands and not on state lands. The report of this incident indicates the individual who owned the dogs was trespassing. Also, the investigation indicated that all EPA use restrictions were followed.

**3. 1999 Incident in Colorado / Dog (page 20 of Petition).** In Crawford, Colorado an APHIS WS employee following incorrect property boundary information provided by a ranch foreman inadvertently placed two M-44s on an adjacent landowner's property. The action resulted in the death of the neighboring landowner's dog. This action resulted in a warning letter from the Colorado Department of Agriculture. A letter of warning from APHIS WS was also issued to the employee. The incident resulted in a settlement to the dog's owner of $9,500. Guidance was provided to APHIS WS employees to obtain the boundaries of property from a creditable source to avoid these situations in the future.

**4. 2001 Incident in Colorado / Dog (page 20 of Petition).** An APHIS WS employee placed several M-44s on a ranch in Huerfano County and mistakenly left two devices when removing the M-44s. A dog owned by a neighbor was killed by one of the M-44s on that property. The dog owners did not have permission to be on the ranch property. An investigation revealed several policy and regulation infractions, and the involved APHIS WS employee resigned his position. No claim was officially filed.

In sum, APHIS WS use of M-44s and LPCs has resulted in only a very limited number of incidents involving people and domestic dogs. Additionally, the average annual release of sodium cyanide (32.66 kg) and of sodium fluoroacetate (0.0396 kg) under restricted and accountable conditions does not pose the magnitude of bioterrorism risks that are claimed by the petitioners. APHIS WS inventory of these materials as of the end of FY 2006 (53.39 kg of sodium cyanide in secure pesticide storage facilities in 16 states, and 0.127 kg of sodium fluororacetate in secure pesticide storage facilities in 10 states) does not constitute a "stockpile" as further claimed by the petitioners. A bioterrorism risk evaluation for Compound 1080 was described by Field (2002) based on a single location release of 1.0 kg of the substance. That amount is nearly 700% greater than APHIS WS' total national inventory that is secured in multiple locations at the close of FY 2006, and more than 2400% greater than APHIS WS average annual release of 0.0396 kg through field use of LPCs in multiple locations during FY 1996-2006. APHIS WS use, inventory and accounting of these products is in compliance with policy, laws, and regulations, and the program has satisfied all issues presented in an OIG audit of APHIS WS' controls over hazardous materials inventory (OIG 2004). Despite these low risks, APHIS WS places great importance on security and accountability of these restricted use pesticide products and will continue to implement controls and restrictions on their use, storage, and inventory.

## 3.0 Economics of Predation Management to Protect Livestock

Determination of the economic benefit of the APHIS WS livestock protection program, and, in particular, the benefits of using M-44s and LPCs is difficult since livestock losses avoided or prevented are generally not known. GAO's (2001) report entitled, "Wildlife Services Program, Information on Activities to Manage Wildlife Damage," was submitted to the US Senate and House of Representatives (GAO 2001). The report, based on a review of the program, visits to regional, state and research offices, and meetings with employees and partners, provides insight into the issue of development of a cost benefit analysis for a wildlife damage management program that is designed to prevent future damage as well as react to it. The U.S. General Accounting Office (2001) further reported that, "*Some groups that take issue with WS activities suggest that its programs are not cost-effective because the money spent on livestock protection exceeds the value of the losses"* that occurred prior to APHIS WS activities. Correct economic analysis considers prior and prevented losses. Regarding APHIS WS analyses, the report stated, "*The most comprehensive study, issued in 1994, concluded that the WS current program, which uses all practical methods (both lethal and nonlethal) of control and prevention, was the most cost effective of the program alternatives evaluated*." The GAO recognized that inherent difficulties bedevil any attempt to quantify the costs and benefits of a program designed to prevent damage. Key among these difficulties are (1) projecting the degree of losses that would have occurred absent the program, (2) valuing those losses, and (3) valuing the program benefits. The report states that it may be misleading to focus only on the value of losses that occur with a control program in place and to disregard the value of the damage that is prevented by the program.

**The Relative Economic Importance of Sheep and Cattle to the United States Economy**

The petitioners allege that since livestock numbers, particularly sheep, are in decline, and that livestock have become expendable. On the contrary, the sheep and cattle industries are still important economic industries that benefit many Americans. To determine the relative importance of the sheep and cattle industries as a percentage of the Gross Domestic Product (GDP), relevant economic indicators (total # of head, total # of operations, real and nominal prices, imports and exports and real cash receipts) must be examined from NASS (2007) data. Additionally, it should be noted that millions of livestock are still present in the United States and that PDM is a vital part of many operations.

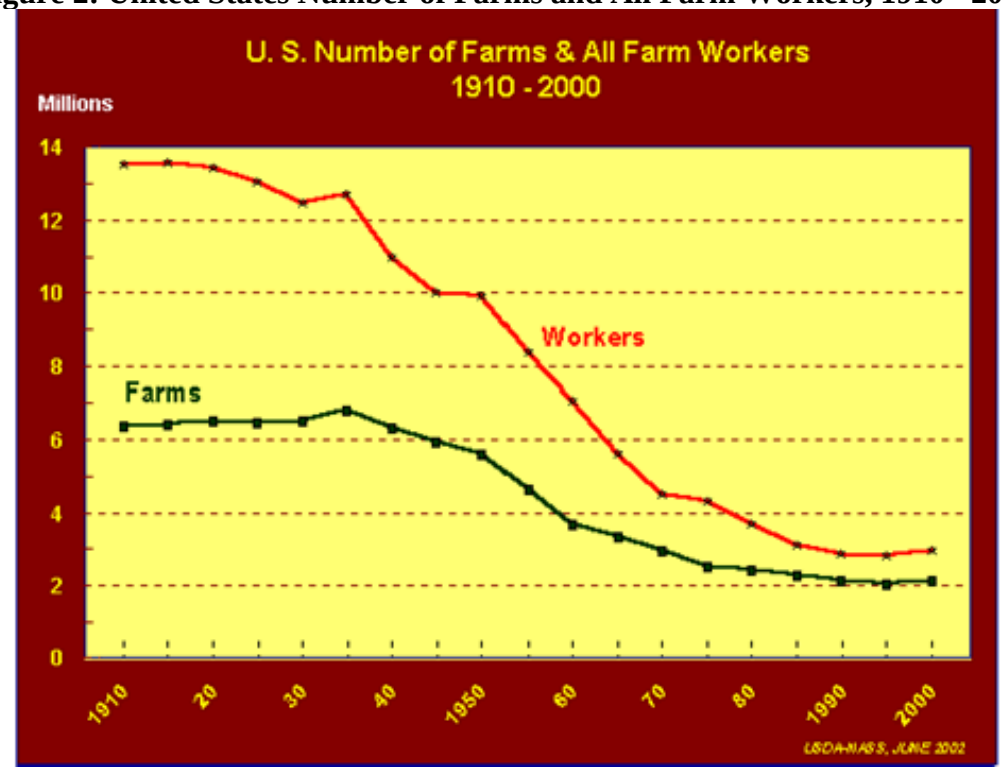
The agriculture sector in the United States is critical to the economy because it acts as the principle source of food for American citizens. Additionally, this sector has traditionally been an important employer of Americans. For example, in 1986, the total workforce in U.S. farms was estimated at over 3 million workers, while today this sector employs over 1 million workers. In 2005, the agricultural sector generated $96 billion in value added to the United States economy. The United States share of the global market for goods is just under 20% and the United States is a net exporter of agriculture products, exporting $59.6 billion worth in 2006. The United States is also an important source for food, crops, and other agriculture needs for humanitarian purposes to the rest of the world.

Examples of agricultural industries that would economically benefit from the use of LPCs and M-44s include, range beef cattle and calves, sheep and lambs, and goat operations. Numerous factors can play a role in the success of these types of operations including, disease, weather, natural disasters, accidents and predation. Animal husbandry techniques exist that can mitigate the impact of several of these factors. For example, livestock disease transmission can potentially be mitigated through vaccinations and improved surveillance and herd management, animal injuries are treated through veterinary care and correct animal handling and predation losses can be limited though defensive protection measures such as the use of LPC and M-44s.

Because the agricultural and livestock sectors are heavily linked or connected to other sectors of the economy (i.e. retail, service, manufacturing, etc.), multiplier effects from these sectors are greater than for many other sectors in the economy. For example, for every dollar spent on food in the United States only $0.20 pays the farmer while the remaining $0.80 is paid to linked industries such as labor, packaging, transportation and advertising (Federal Emergency Management Agency 2008). Given the importance of the agricultural sector in the United States economy, any changes to this sector can have enormous implications to the rest of the country. This is often the justification for protections and subsidies to this sector as well as preparedness for natural disasters affecting this sector.

Figure 2 illustrates the decline in number of farms and farm workers between 1910 and 2000.

**Figure 2: United States Number of Farms and All Farm Workers, 1910 - 2000**




## Sheep

The sheep and lamb industry has also changed in several distinct ways over the past 20 years. Examining Table 11, clear trends have developed in several key industry variables including nominal and real cash receipts, number of operations, and total number of head.

Table 11. Sheep and Lamb industry variables in the United States, 1986 – 2006.

| Sheep and Lambs | 1986 | 2006 |
|---|---|---|
| Nominal Cash receipts | $483,541,000 | $480,561,000 |
| Real Cash receipts (CPI 82-84 = 100) | $441,187,000 | $238,374,000 |
| Number of operations | 112,580 | 69,069 |
| Total number of head | 10,114,700 | 6,230,000 |

Nominal cash receipts (the value of livestock at that current time) have decreased over time, which has lead to a decrease in real cash receipts (the value of livestock adjusted for inflation), represented by an

approximate decrease of 46%. The number of operations has decreased by 38.6% and the total number of head has fallen by 38.4%. This indicates that the sheep industry, has seen a concentration of small farms to large farms, and that sheep operators have left the industry and not been replaced. However, Table 12 shows that from 1998 to 2002 sheep farms of all sizes have remained relatively constant, and that the sheep industry is still quite important in the United States.

Table 12. Breeding sheep farm composition (percent of operations by group size) in the United States, 1998-2002.

| Year | 1-99 Head | 100-499 Head | 500-4,999 Head | 5,000+ Head |
|---|---|---|---|---|
| 1998 | 90.8 | 6.8 | 2.3 | 0.1 |
| 1999 | 90.6 | 7.3 | 2.0 | 0.1 |
| 2000 | 91.2 | 7.2 | 2.0 | 0.1 |
| 2001 | 90.8 | 7.5 | 1.6 | 0.1 |
| 2002 | 91.1 | 7.3 | 1.5 | 0.1 |
| 2003 | 91.8 | 6.7 | 1.4 | 0.1 |
| 2004 | 92.2 | 6.3 | 1.2 | 0.1 |

In 2006, six million head of sheep were raised in 69,000 operations across the country. Nominal sheep and lamb prices have increased over the past 40 years, but prices, adjusted for inflation, have decreased. In 2006, real cash receipts were about $238 million. Imports and exports of live sheep and goats and their meat have fluctuated during the past 18 years. Exports of live sheep and goats are greater than imports. In 2006, the total value of exports of live animals totaled $9.9 million, while imports were $415,000. The total value of imported and exported sheep and goat meat is much greater than that of live sheep and goats, and the ratio of exports to imports is reversed. In 2006, total exports of sheep and goat meat were $25 million, while total imports were $466 million. These figures suggest that the demand for sheep and goat meat is still high in the United States. The relative importance of sheep in the United States economy has fallen. In 1966, real cash receipts for sheep and lambs as a percentage of GDP was 0.031%. By 2006, cash receipts fell to 0.0021% of GDP. However, sheep are still an economic factor in the United States, and the industry is locally and regionally significantly more important in many parts of the country.

Inventories for sheep and goats in July 2007 were 7.73 and 3.60 million head, respectively (NASS 2007). In 2004 (NASS 2005), predators killed 224,200 sheep and 155,000 goats worth $18 million and $16 million, respectively. Coyotes were the predominate predator of sheep, and killed 135,600. Dogs and foxes, species also targeted with M-44s, killed 29,800 and 4,200 sheep, respectively. NASS (2005) did not provide the number of goats killed by the different species of predators. However, if goat predation rates were similar to sheep, coyotes, dogs, and foxes would have killed an estimated total of approximately 117,300 goats. Thus, 287,000 sheep and goats were estimated to have been killed by predators that can be targeted with the M-44 and LPC. These losses occurred despite predation management efforts being conducted by APHIS WS, the sheep producers, or other agents of the sheep producer. Predation rates would have been much higher had predation damage management not been conducted (Henne 1975, Munoz 1977, Nass 1977, Tigner and Larson 1977, O'Gara et al. 1983, Howard and Shaw 1978, Howard and Booth 1981).

The petitioners have stated that since sheep inventories have dropped, the M-44 and LPC should not be used. APHIS WS believes that continued registration of M-44s and LPCs are critical to integrated pest management programs to reduce predation on livestock, including the 11 million sheep and goats that are still present in the United States.

## Cattle

The cattle and calf industry has changed in several distinct ways over the past 20 years. Trends have developed in several key industry variables including nominal and real cash receipts, number of operations and total number of head (Table 13).

Nominal cash receipts have increased over time, while increases in real cash receipts have been eroded by inflation at an approximate decrease of 7.6%. While the number of operations has decreased by 32.5% the total number of head (individual cattle and calves) has only fallen by 8.2%. This indicates that cattle operations have become more concentrated over this time period. This is further supported by Table 14 which shows that from 1993 to 2006 cattle farms with fewer than 500 head have decreased while those farms with greater than 500 head have increased.

Table 13. Cattle and calf industry variables in the United States, 1986 – 2006.

| Cattle and Calves | 1986 | 2006 |
|---|---|---|
| Nominal Cash receipts | $28,910,057,000 | $49,148,364,000 |
| Real Cash receipts (CPI 82-84 = 100) | $26,377,789,000 | $24,379,149,000 |
| Number of operations | 1,438,620 | 971,400 |
| Total number of head | 105,378,200 | 96,701,500 |

Table 14. Number of cattle farm operations categorized by number of head, United States, 1993 – 2006.

| Year | 1-49 Head | 50-99 Head | 100-499 Head | 500-999 Head | 1000+ Head |
|---|---|---|---|---|---|
| 1993 | 774,600 | 204,180 | 209,140 | 17,125 | 8,735 |
| 1994 | 755,500 | 207,490 | 208,610 | 17,070 | 8,620 |
| 1995 | 745,500 | 207,780 | 209,860 | 18,310 | 9,180 |
| 1996 | 734,000 | 205,030 | 210,760 | 17,980 | 8,930 |
| 1997 | 715,040 | 200,550 | 205,390 | 17,750 | 9,320 |
| 1998 | 694,900 | 194,510 | 198,005 | 17,850 | 9,385 |
| 1999 | 685,100 | 186,830 | 196,140 | 18,100 | 9,390 |
| 2000 | 670,650 | 185,650 | 191,710 | 18,630 | 9,730 |
| 2001 | 653,950 | 178,870 | 187,890 | 18,665 | 9,795 |
| 2002 | 647,450 | 174,990 | 185,840 | 18,315 | 9,835 |
| 2003 | 633,200 | 170,370 | 182,240 | 17,970 | 9,790 |
| 2004 | 618,750 | 163,750 | 178,530 | 18,445 | 9,985 |
| 2005 | 612,200 | 163,780 | 177,510 | 18,820 | 10,200 |
| 2006 | 605,200 | 160,650 | 175,890 | 19,180 | 10,480 |

The cattle and calf market has differed from the sheep and lamb market in many of these indicators. The total head of cattle and calves is greater than it was in 1900. Since 2000, cattle inventories have fluctuated at around 96 million head. The number of beef cows and heifers that calved in 2006 was 33 million. The total number of cattle and calf operations has fallen over the last 40 years, and was approximately 1 million in 2006. Nominal cattle and calf prices reveal an increase during the past 40 years, but adjusted for inflation, real cattle and calf prices have been falling. Even so, real cash receipts were $24.4 billion in 2006. Imports have been greater than exports of live bovine animals and in 2006, imports totaled more than $1.56 billion whereas exports were less than $27 million. In 2006, total imported bovine meat was $2.8 billion and total exported bovine meat was $1.4 billion. It should be noted that in 2004, after the discovery of BSE in domestic herds, the volume of exports of meat diminished considerably. In 1966, real cash receipts for cattle and calves as a percentage of GDP was 0.946%. In 2006, cash receipts had fallen to 0.215% of GDP.

Inventories of cattle in July 2007 were 105 million head (NASS 2007). In 2005 (NASS 2006), predators killed 197,000 head of cattle valued at $55 million. Of the predators that can be taken with M-44s, coyotes

killed 97,000 and dogs killed 21,000 head of cattle. These losses occurred even with an unknown percentage of the cattle being protected by predation management programs. Thus, as with sheep, cattle losses would have been higher had predation management not been conducted in many areas where predator losses were occurring. With 105 million head of cattle in the United States, many, primarily calves, would benefit from protection from predators through application of integrated predation management programs that may include M-44s.

**Cost-effectiveness of Predation Management to Protect Livestock**

There is considerable evidence that predation damage management, including the use of M-44s and LPCs to protect livestock, is both effective in preventing damage, and is cost effective. The EPA evaluates the cost-effectiveness of the use of chemicals on the resources they are designed to protect. In the case of M-44's and LPCs, the petition requested analysis of the agricultural economy, economics of predators in the ecosystem, and benefits lost from removal of predators for wildlife watching and hunting.

The cost-effectiveness of APHIS WS activities is often an important consideration when implementing programs or projects to protect resources. A detailed economic analysis of APHIS WS PDM program was conducted by USDA in the APHIS WS programmatic EIS (USDA 1997). The analysis indicated that the APHIS WS program was cost effective and that the current APHIS WS program uses methods consistent with that analysis. Conditions related to predation losses and predator conflicts with livestock have not substantially changed since that analysis. In evaluating cost effectiveness of predation damage management programs, USDA (1997) concluded that benefits, in terms of avoided sheep and lamb losses plus price benefits to consumers, are 2.4 times the cost of providing APHIS WS predation management services for sheep protection in the 16 western states (USDA 1997). Additionally, APHIS WS completed cost:benefit analyses in a number of Environmental Assessments (EA) completed in the 1990's, based on detailed information reported by program personnel and program recipients. APHIS WS EA's for New Mexico and Arizona found that the cost of the predation damage management programs in those states, including the protection of all agricultural activities from wildlife, provided a benefit of two to four times the cost for just protecting sheep and cattle.

Additionally, there is legal support for application of APHIS WS programs despite the level of damage that has already occurred. The U. S. District Court of Utah (Civil No. 92-C-0052A, 1993) stated, "*various statutes, regulations and plans guide the implementation of [WS] programs. Federal authority for animal damage management programs emanates from the Animal Damage Control Act of 1931, 7 USC § 426 to 426(b) (the ADCA), which directs the Secretary of Agriculture to "conduct campaigns for the destruction" of animals injurious to agriculture and livestock . . .*" Furthermore, the court ruled that, "**. . .** *the agency need not show that a certain level of damage is occurring before it implements an [animal damage control] program… Hence, to establish need for an [animal damage control program], the forest supervisors need only show that damage from predators is threatened*" (U. S. District Court of Utah, Civil No. 92-C-0052A, 1993).

APHIS WS focuses predation management activities on prevention of future livestock losses, and its activities are not requested uniformly over the entire United States. Livestock producers typically request APHIS WS assistance as soon as possible after predation is identified, and do not wait long periods of time until substantial losses are accumulated to justify direct management. "Low" predation losses are not a justification to remove available management tools such as M-44s and LPCs, and are not an accurate measure of harm. Also, certain individual livestock producers suffer disproportionately higher losses than what is reflected in industry-wide "averages" (FWS 1978) and maintaining the availability of adequate management tools is a more serious issue for those producers.

Historically, the use of toxicants has been very cost-effective (Cain et al. 1972, Gum et al. 1978). Computer simulation modeling of various coyote damage management options suggests that, in general, damage management programs employing toxicants provided the greatest net economic benefits (Gum et al. 1978). Cain et al. (1972) noted that toxicants were *"conspicuously effective and economical."* In recent decades, however, regulatory changes and societal values focus more on issues of environmental responsibility and conservation objectives than economics when deciding on pesticide use. As use restrictions increase for predation damage management methods such as M-44s and LPCs, cost-effectiveness declines (Connolly 1981). APHIS WS values consideration of environmental and conservation objectives, as well as economics, in its decision-making regarding pesticide use.

Costs of programs to reduce/prevent damage include: funds expended by producers for non-lethal methods, foregone costs associated with opportunities lost due to unacceptable predation losses, values of wildlife removed by the program (both positive and negative), costs associated with litigation by groups to eliminate predation management programs, and others. For this analysis, APHIS WS considered those costs paid directly by the program (federal and non-federal costs) and the effects on agriculture and natural resources. While calculable, the cost:benefit ratio of specific methods is not directly connected to economic analyses for integrated programs that include a wide variety of methods and techniques. However, simple cost analysis calculations are used to assist with selection of methods when using the APHIS WS Decision Model (Slate et al. 1992).

The petitioners have expressed a concern that lethal predation management methods are not effective in reducing livestock losses. Although it is impossible to accurately determine the amount of livestock APHIS WS programs save from predation, it can be estimated. In areas without some level of predation management, losses of adult sheep and lambs to predators can be as high as 8.4% and 29.3% of the total number of head, respectively (Henne 1975, Munoz 1977, O'Gara et al. 1983). Additionally, sheep and lamb losses are generally lower where predation management is applied (Nass 1977, Tigner and Larson 1977, Howard and Shaw 1978, Howard and Booth 1981). Although these studies were not specifically designed to determine the difference in losses that occur with or without predation damage management on the properties studied, they provide the best information available for estimating the difference. Shwiff and Merrell (2004) reported 5.4% increases in numbers of calves brought to market when coyotes were removed by aerial hunting. Bodenchuk et al. (2002) reported predation management cost:benefit ratios of 1:3-27 for agricultural resource protection.

Estimates of cost:benefit provided by APHIS WS PDM efforts to protect sheep in the western United States have ranged from 1:2.4 (USDA 1997) to 1:7 (Connolly 1981). Collinge and Maycock (1997) assessed the economic benefits of PDM efforts to protect sheep in southern Idaho and conservatively estimated the cost:benefit ratio at 1:3 with aerial hunting alone producing a 1:5-7 cost:benefit. Packham's (1973) data from southern Idaho indicated that for every additional dollar spent for helicopter aerial gunning to remove coyotes on four study areas, an average of $5.20 worth of sheep and lambs were saved. These ranges of economic benefit fall generally within the range of those discussed by other authors. Thompson (1976) suggested a 1:3.9 cost:benefit ratio for PDM with trapping as the primary tool in California, and Pearson and Caroline (1981) estimated a cost:benefit ratio of 1:4.5 for PDM during a one-year analysis period in Texas. Bodenchuk et al. (2002) estimated a 1:3 cost:benefit ratio for all APHIS WS predation management efforts to protect livestock in the western United States, but this ratio rose to approximately 1:12 when considering the economic multiplier effect within local communities of livestock saved from predation. In a study by Wagner and Conover (1999) there were two direct economic benefits associated with preventive aerial operations: 1) a reduction in lamb losses to coyote predation, and 2) a reduction in the hours required for corrective predation management. Using the median difference between treated and untreated sites in estimated lamb losses to coyote predation, preventive aerial operations resulted in a savings of 17.5 lambs/area as compared to untreated areas, which equated to a 1:2.1 cost:benefit ratio. Further, a review by

GAO concluded that all of the available, credible analyses on the cost-effectiveness of APHIS WS wildlife damage management activities suggest that benefits exceed costs (GAO 1990, 2001).

The value of predators removed by the APHIS WS program has also been raised as an issue and that predators have value by providing "ecosystem services." APHIS WS recognizes that native wildlife including predators have positive values to society and the environment. As discussed earlier, APHIS WS PDM programs to protect livestock do not significantly affect target and nontarget species populations. APHIS WS EAs have concluded that the cumulative take of predators by APHIS WS and others has not significantly affected any population, thus "ecosystem services" provided by predator populations have not been significantly impacted by APHIS WS PDM.

Wildlife is an asset to society, and their values may be calculated from societal "willingness-to-pay" surveys, actual expenditures for wildlife related recreation, established civil values set by wildlife agencies or legislatures, or some combination of these. While native wildlife populations have net positive values, individual animals of each species may have negative societal values (Conover et al.1995, Conover 2002).populations Deer, for example, have a net positive value, but those hit by cars have negative values, such as, associated injuries to the occupants, damage repairs to the vehicle, and insurance premium increases. The predators removed by APHIS WS are associated with losses to livestock and wildlife, or pose a risk to human health or safety. These individual predators, which represent a smaller portion of the total predator population, have a net negative value to society.

The benefits from predation management may have an ecological role (e.g., saving an endangered species or removal of invasive species from environments) or provide enhanced values to the landscape as a whole (e.g., a positive return to a ranching enterprise may preclude development which alters the landscape). These values may be difficult to calculate but are part of the overall predation management economic picture. However, assessing an economic benefit for efforts to protect game species from predation could be approached by comparing the costs of predation management to the value of species saved. Smith et al. (1986) used this approach to determine that coyote removal by aerial operations was a cost-effective method of increasing antelope populations in their study area in Arizona. Civil values have been assigned for many common species of wildlife and can be used to calculate their value.

Hoff (1999) estimated the cost per incremental[15] duckling produced by predator removal versus habitat improvement. His estimates indicated that each additional duckling produced through predator removal cost about $4; while each additional duckling produced through habitat improvement cost approximately $321.

In the case of threatened and endangered species, their value has been judged "incalculable" (*Tennessee Valley Authority vs Hill*, U.S. Supreme Court 1978), making it more difficult to specifically quantify the cost effectiveness of efforts to restore or protect these species. Although economic values have not been assessed for species such as sage grouse, given the high social value of rare species and their special conservation concern, it is reasonable to anticipate a positive benefit-cost ratio for efforts to enhance these species' populations through predation management.

Economic values have not been assessed for threatened and endangered species such as Canada lynx or black-footed ferrets. However, Bodenchuk et al. (2002) noted that costs associated with recovery of listed species could be used to conservatively estimate benefits from predation reduction efforts, and their Utah data showed a cost:benefit ratio of 1:24 for black-footed ferret protection.

15 Incremental duckling production was defined as the number of ducklings hatched on treatment sites minus the expected production in the absence of treatment.

APHIS WS protection of wildlife is coordinated with state wildlife agencies and, as appropriate, FWS, and currently includes protection of greater sage-grouse, Gunnison's sage-grouse, desert tortoise, black-footed ferrets, ring-necked pheasants, nesting waterfowl and shorebirds (including several threatened and endangered species), mule deer, pronghorn, bighorn sheep, and Utah prairie dogs.

## 4.0 Clarification and Correction of Inaccuracies in the Petition

The petitioners discuss many issues that are outside the scope of EPA registration of M-44s and LPCs. A number of the issues are inaccurate, unclear, or conjecture. However, APHIS WS believes that these issues should be clarified and corrected.

**OIG Audits**

Pg. 2 of the petitioners' letter to EPA. ". . . *APHIS failed two federal audits in 2005 and 2006 concerning their handling of and accountability for lethal toxicants, EPA should ban the manufacture and distribution of sodium cyanides . . .* [and] ... *Compound 1080 at the earliest possible moment."*

Pg 16. *"In the first audit (June 2005), the OIG found that APHIS . . . (OIG 2006a). In the second, the OIG found that APHIS . . .(OIG 2006b)."*

The audit reports (Evaluation of the Implementation of the Select or Toxin Regulation, Phase 1, Audit no. 33601-2-At) referenced by the petitioners for 2005 and 2006 did not involve APHIS WS, but did involve other APHIS programs (Veterinary Services and Plant Protection and Quarantine).

However, APHIS WS has worked closely with USDA OIG and the USDA Office of the Chief Financial Officer (OCFO) regarding hazardous materials inventory and accountability as a result of a 2001 OIG Management Alert. The audit included eight recommendations pertaining to accountability of pesticides and controlled drugs, four recommendations pertaining to storage and security of hazardous materials, and one recommendation pertaining to inspections of materials inventories (OIG 2004). As of April 2007, APHIS WS has obtained closure of all the audit recommendations through strengthened management controls and improvements in the program's inventory process. APHIS WS has implemented a comprehensive inventory accounting system called CMITS for hazardous materials and controlled drugs that APHIS WS uses in wildlife damage management (details below), and has updated and strengthened its management Directives (described below) pertaining to pesticides and hazardous materials. APHIS WS's hazardous materials management system is rigorous and responsive to program needs, and is accountable to OIG, APHIS, WS, and other government-wide policies and requirements.

**Bioterrorism Risk Issue**

Pg. 2. ". . . *because sodium cyanide and Compound 1080 could be used as bioterrorism agents . . . the EPA should ban. . .*"

Pg. 12. *". . . as we pointed out above, APHIS has been careless with controlling lethal toxicants—risking, as the Office of Inspector General reported—a potential bioterrorism threat."*

Pg. 38. *"APHIS cannot account for its handling of the substance: . . . They pose a very real bioterrorism threat . . ." – Yet the risk of stockpiling. . "*

The petitioners have expressed concern that chemicals held by APHIS WS may be stolen and used by terrorists, and they referred to several OIG audits. APHIS WS has implemented and continues to implement

recommendations for enhancing security of hazardous materials pursuant to the 2004 OIG audit, and has taken the necessary and reasonable steps required by OIG and APHIS WS policy. Detailed information on the audits and implemented actions were discussed in Section 1.2. Additionally, it should be noted that APHIS WS uses minimal amounts of sodium cyanide and sodium fluoroacetate, and does not possess "stockpiles" of these chemicals as incorrectly stated by the petitioners. APHIS WS makes every effort to safeguard the use of these chemicals from any illegal activity, potentially including bioterrorism.

APHIS WS' average annual release of sodium cyanide (32.66 kg) and of sodium fluoroacetate (0.0396 kg) under restricted and accountable conditions does not pose the magnitude of bioterrorism risks that are claimed by the petitioners. APHIS WS inventory of these materials as of the end of FY 2006 (53.39 kg of sodium cyanide in secure pesticide storage facilities in 16 states, and 0.127 kg of sodium fluororacetate in secure pesticide storage facilities in 10 states) does not constitute a "stockpile" as further claimed by the petitioners. A bioterrorism risk evaluation for Compound 1080 was described by Field (2002) based on a single location release of 1.0 kg of the substance, an amount that is nearly 700% greater than APHIS WS' total national inventory that is secured in multiple locations. Further, the 1.0 kg amount in the study is more than 2400% more than APHIS WS' average annual release of sodium fluoroacetate (0.0396 kg). APHIS WS inventory and accounting of these products is in compliance with policy, laws, and regulations, and has satisfied all issues presented in an OIG audit of APHIS WS' controls over hazardous materials inventory (OIG 2004). Despite these low risks, APHIS WS places great importance on security and accountability of these restricted use pesticide products and will continue to implement controls and restrictions on their use, storage, and inventory.

**Petitioners' Misrepresent Data on APHIS WS Take and Expenditures**

Pg 2. "*Most of the species that APHIS-WS killed were killed with various poisons. Nevertheless, of the 101,225 mammalian carnivores…"*

*Pg. 7. "APHIS-WS continues to indiscriminately kill carnivores at alarming rates. In 2004, for example, Wildlife Services spent $101,490,740 to kill 2.7 million animals . . ."*

Pg. 9. *"The number of predators killed to protect livestock is highly disproportionate—perhaps on the order of 1.5 to 9.7 million animals . . ."*

APHIS WS is involved in many wildlife damage management programs, and the petitioners frequently present statements suggesting that they are all tied to the use of the M-44 and LPC. For example, suggesting that APHIS WS indiscriminately kills carnivores and took 2.7 million animals in 2004 together is misleading. The consideration should focus on M-44 and LPC take of specific target canids which represented 0.4% of the species taken by APHIS WS in 2004. Similarly for the period FY 1996-2006, APHIS WS' average annual take of target mammals by M-44s and LPC is 16,820 and 47, respectively. APHIS WS nontarget take for that time period is 5% for use of M-44s and less than 1% for use of LPCs. In addition, stating how much is spent on all wildlife damage management activities by APHIS WS ($100 million) is misleading because in reality APHIS WS spent only a portion of overall program funding on livestock protection for all predator and bird damage (<$20 million) and only a fraction of that on use of the M-44 and LPC.

During FY 2004, APHIS WS took less than 100,000 mammalian carnivores with various legal methods. M-44 take during FY 2004 consisted of 12,169 target animals (coyotes, red fox, gray fox, and feral dog) and 814 nontarget animals (Table 3). LPC take during FY 2004 consisted of 47 coyotes, and one incident where a domestic dog was taken after it consumed contaminated fleece that was being transported in a truck (Table 6). The petitioners' charge that APHIS WS took nearly 10 million predators during FY 2004 is inaccurate, and based on assumptions and extrapolations of information from reports that are not related to actual

program operation. APHIS WS retains detailed records of all animals taken, and they are reported here and available to the public on the program's website as Program Data Reports (see Section 1.2, Program Accountability).

**Species Impacts Outside Scope or Overstated**

Pg. 8. *"Carnivores contribute . . . " - "Wolves indirectly brought . . ." - " . . . the presence of puma . . . " – " "Yet in many western states, black bears, mountain lions, and bobcats . . . "*

We believe the petitioners are leading the EPA and other readers into believing that either APHIS WS uses the M-44 and LPC to target more species than the canids actually targeted (coyotes, red fox, gray fox, arctic fox, and feral dog) or suggesting that far more nontargets are taken than APHIS WS reports. APHIS WS use of M-44s targets coyotes, red fox, gray fox, feral dogs and arctic fox with nontarget animal take during FY96-FY06 at less than 5%. APHIS WS use of LPCs targets coyotes only with nontarget take during FY96-FY06 at less than 1%. The few bobcats (6), black bears (2), mountain lions (<1), and wolves (<1) taken annually from FY96 to FY06 with the M-44 and LPC as nontargets would have a negligible impact on these species' populations. These species are not targeted by APHIS WS, and they are minimally impacted by program use of M-44s and LPCs.

APHIS WS partners closely with other federal agencies and state agencies to conduct management programs involving gray wolves, mountain lions, coyotes, black bears, and other wildlife species, and takes these animals pursuant to permits, agreement, and other authorizations. Further, APHIS WS take of gray wolves under agreements with the FWS and states, by methods other than M-44s and LPC, is not relevant to considerations on continued registration of sodium cyanide and sodium fluoroacetate.

**Nontarget Take by APHIS WS**

Pg. 1. "*The numbers of predators killed to protect livestock is highly disproportionate – perhaps on order of 1.5 to 9.7 million animals were killed for the benefit of agricultural interests "without cause" (that is, indiscriminate killing) by federal agents during the period 1996 to 2001…*"

The petitioners claim that APHIS WS took 1.5 to 9.7 million nontarget animals from FY96 to FY01. This is a gross misinterpretation of data. This claim is based on a citation (Treves and Karanth 2003) that assumed that 11-71% of the animals taken by APHIS WS were nontarget animals because they were not responsible for damage. This assumes that APHIS WS is targeting animals with management methods in the general area of damage and the specific individual responsible for damage is not being taken. The authors added up all known APHIS WS take from FY96 to FY01, including animals already identified as nontargets, and calculated nontarget take for all APHIS WS wildlife damage management programs.

Firstly, the authors stated that their calculation of 1.5 to 9.7 million nontarget animals taken was based on " *… a survey of systematic studies of lethal control (Treves et al. 2004* [2005[16]])." Treves and Naughton-Treves (2005) cited 6 studies, 3 on coyotes (n=163 total coyotes, captured primarily with traps, that were necropsied in the 3 studies), 1 on black bears, and 2 on foreign predators to formulate this conclusion. Thus, the conclusion was based on just a few studies of mammalian predators and small sample sizes using a limited number of PDM methods. While APHIS WS conducts much PDM for agricultural interests, predators taken in PDM are only a minor portion of APHIS WS take (usually <10%) and predators are taken to protect a wide variety of resources including agricultural and natural resources, property, and human health and safety. Therefore, to extrapolate nontarget take for all wildlife damage management programs

[16] The Treves et al. (2004) citation from Treves and Karanth (2003) was in press in "People and Wildlife: Conflict or Coexistence." This was not published until 2005 and the authors changed to Treves and Naughton-Treves (2005)

conducted by APHIS WS for all species taken with a myriad of techniques is not comparable to these studies because most APHIS WS programs are highly target specific.

Secondly, the current science for predation management does not allow for determining which coyotes in an area are the "offending individuals," thus most removal operations tend to target all coyotes in the area. Blejwas et al. (2002) and Linnell et al. (1999) found that, given the chance, most coyotes are likely to be, or become, coyotes that kill sheep; thus, removing any coyote in an area where sheep occur can be considered target species removal. An exception, however, is when we use the LPC because it *only* targets, and removes, coyotes that actually are "offending" individuals. If this were the petitioners' only issue, then we would expect them to support the use of the LPC. Thus, APHIS WS believes that coyotes taken in the area of a livestock operation are target individuals even those that had not necessarily killed livestock yet.

Thirdly, the authors extrapolated nontarget take, 1.5 to 9.7 million, for all of APHIS WS take which includes birds (the majority), non-predatory mammalian species such as rodents, reptiles, and fish, as well as animals that were already identified as nontargets. For example, APHIS WS took 1.76 million animals in FY01 (the last year cited by Treves and Karanth (2003)) including 1.75 million targets. Of this, 68% were European starlings, 9% were mixed blackbirds (blackbirds, cowbirds, and grackles), 6% were feral rock pigeons, 5% were coyotes, 2% were beavers, and 10% were other animals. Of the total, 118,000 were predators (6.7%) taken for the protection of all resources (e.g., numerous raccoons, striped skunks, opossums and other predators are taken for the protection of property in urban settings). As can be seen, the authors and the petitioners extrapolated their findings for lethal predator control programs to protect "*agricultural interests*" for about 93% of the animals taken in APHIS WS wildlife damage management programs; however, many of these animals were taken for the protection of resources other than agriculture. Methods to take starlings, blackbirds, and feral pigeons (83% of the APHIS WS total take) are highly selective for the target species and, therefore, calculating nontarget take for these species similar to the calculations done by Treves and Karanth (2003) is a gross misrepresentation of the data. Treves and Karanth (2003) would have calculated that, of the 1.2 million starlings taken by APHIS WS, 130,000 to 850,000 of these would have been nontargets because they were not involved in damage (most starlings are taken at feedlots and 99.99% would have been involved in damage). This alone would reduce the estimated nontarget take considerably.

Finally, Treves and Naughton-Treves (2005) cautioned the reader *"… against uncritical use of these data, because absence of evidence for an individual animal's involvement in conflict cannot fully exonerate it*." APHIS WS concurs with this conclusion.

**APHIS WS Wildlife Damage Management and the Environment**

Pg. 9. "*APHIS-WS has done little to benefit ecosystem health, and instead contributes indirectly to habitat dysfunction because it kills so many species, especially top-level carnivores for ill-conceived livestock protection regimes, but also to increase prey species (e.g., deer, pronghorn, and elk)*." - ". . . *called high levels of predator killing the "sledgehammer" approach to wildlife management . . .*"

In most of the areas where APHIS WS is requested to conduct PDM, the ecosystems are already greatly altered from pristine pre-European settlement because of land use and management that has occurred for many decades or centuries. Ecosystem "health" is a concept that is popularly used in rhetorical contexts, and is subjective. APHIS WS has analyzed the effects of APHIS WS PDM activities in numerous environmental documents and has concluded that such activities, which include the use of the two methods that are the subject of this review, do not have significant effects on ecosystems. In states where top level carnivores such as mountain lions and black bears are hunted as game animals, APHIS WS take is typically low in comparison to hunter harvests and a very minor percentage of estimated populations.

Also, it is important to keep in mind that, except for Federal T&E species, mammalian predator species are under the management authorities of the states, and those states can and do in many cases establish their own goals and objectives for managing their populations. Those plans typically prescribe management actions that involve removals of the animals we are requested to assist with, which means such removals are likely to occur with or without APHIS WS assistance. Thus, although the petitioners portray APHIS WS as the entity that makes final decisions with respect to the removal of wildlife and the effects that accrue, that is usually not the case and the "ecosystems" the petitioners referenced in the petition are typically human-influenced landscapes managed by the public and other agencies, and they are not wilderness in character.

In addition, APHIS WS PDM is conducted to address demonstrated needs that actually include benefits to certain ecosystem components as identified by the cooperating entities that request the actions. For example, we sometimes conduct PDM to achieve recovery of certain other wildlife species that a state wildlife agency has determined is below desired management objectives. PDM has been determined to benefit species restoration programs such as the black-footed ferret and Columbia sharp-tailed grouse (*Tympanuchus phasianellus columbianus)* reintroduction. Interestingly, one of the papers cited by petitioners above on the issue of nontarget take (Treves and Naughton-Treves 2005) discussed several studies where lethal predator removal bolstered gallinaceous bird populations in Europe and this paper recognized the importance of lethal PDM as a tool for wildlife management to conduct such activities. PDM is a legitimate part of the mix of strategies and concepts for restoring and benefitting ecosystem structure and function.

**Take of Coyotes and Other Predators and Mesopredator Release**

Pg. 8. "*Coyotes regulated mesopredators . . "*

Mesopredator release is the theory that the removal of larger predators such as the coyote in an area will allow smaller predator populations such as skunk and fox to increase which, therefore, impacts many of the small mammal and bird populations. While the phenomenon of mesopredator release has been documented in the absence of larger predators, this phenomenon would not likely result from APHIS WS's PDM efforts. This comment suggests that the petitioners believe that APHIS WS engages in general population suppression of coyotes across large areas of the United States, which is not the case. As noted in Section 1.4, APHIS WS removes only a minor portion of the coyote population during programs to reduce predation on livestock, and, as described by the GAO (1990), APHIS WS predation management activities have not negatively impacted statewide predator populations in the 17 western states. Given the capabilities for rapid coyote repopulation of areas following localized control and sport harvest actions, we do not anticipate substantial impacts on other predator/omnivore populations (e.g. skunk, raccoon, and fox).

Concerns have been expressed that red fox populations might increase in areas of ground nesting bird habitat where coyote removal is conducted and that red fox would be more significant predators of sage grouse than were coyotes (Gunnison Sage-Grouse Range-Wide Steering Committee 2005). The "mesopredator release" theory allows that smaller predators are allowed to increase due to either a lack of predation or release from competition or both. Gehrt and Clark (2003) present an opposing view of "mesopredator release" and point out several weaknesses in the circumstantial evidence that has been used to suggest that mesopredator release even occurs.

The Gunnison Sage-Grouse Range-Wide Steering Committee (2005) cited studies of red fox and coyote home ranges in duck breeding areas of North Dakota as evidence that red fox numbers may increase if coyote numbers are reduced. Sargeant et. al. (1984) reported on the effects of red fox predation on breeding ducks. Their data were collected when coyote populations were presumably suppressed by widespread use of predacides, and they note that at the time (1968-73), "coyote populations in most of the midcontinent area appear to be suppressed by man." The authors noted an inverse relationship between red fox and coyote populations and speculated that "...protection of coyotes will result in expansion of local or regional

populations that in turn will cause reductions in fox populations." They inferred that this would reduce predation on upland nesting ducks. Sargeant et al. (1987) reported on spatial relationships between coyotes and red foxes and showed that home ranges of fox families did not overlap the core centers of coyote home ranges on a North Dakota study site. Although none of their radio collared foxes were killed by coyotes in their study, they hypothesized that red foxes tended to avoid coyote territories, presumably because of the fear of being killed by coyotes. Thus, they inferred that a red fox population would increase if the coyote population were reduced, because the removal of territorial coyotes would create vacant coyote territories that could then become occupied by red foxes.

However, the presence of coyotes does not completely displace red foxes. Voigt and Earle (1983) verified that red fox travelled through coyote areas during dispersal, but did not establish there. They also reported that "...individual foxes and coyotes can occur in close proximity to each other along territory borders and when coyotes travel into fox areas." They also noted that "fox-coyote range overlap near borders was similar to fox-fox range overlap near borders and that coyotes do not "completely displace foxes over areas." Gese et al. (1996) reported that coyotes tolerated red foxes when encountered about half of the time in Yellowstone National Park, although they also at times were aggressive toward and would sometimes kill foxes.

Also, there are other studies that suggest coyote territories would not remain vacant for very long after the coyotes are removed. Gese (1998) noted that adjacent coyote packs adjusted territorial boundaries following social disruption in a neighboring pack, thus allowing for complete occupancy of the area despite removal of breeding coyotes. Blejwas et al. (2002) noted that a replacement pair of coyotes occupied a territory in approximately 43 days following the removal of the territorial pair. Williams et al. (2003) noted that temporal genetic variation in coyote populations experiencing high turnover (due to control) indicated that "...localized removal did not negatively impact population size..." When we consider the level of coyote removals that APHIS WS PDM activities achieve during PDM actions (only 2-4% of the estimated population - see section 4.1.1.1), it is most likely that coyote populations are probably not impacted enough, even at the individual territorial level, to create the vacant territories that would theoretically allow red fox populations to increase substantially at the local level based on the North Dakota studies discussed above. Therefore, we believe it would be unlikely for APHIS WS's coyote removal actions to lead to indirect increases in predation effects on grouse populations.

**Concerns that WS Employees Will Trespass onto Private Property**

The petitioners have raised the concern that APHIS WS employees could trespass onto private property. Incidents in which mistakes have been made with respect to property boundaries have been rare, and we expect that they will continue to be. APHIS WS is well aware that it is sometimes difficult to determine land ownership in some areas, and APHIS WS field employees make diligent efforts to ensure that they do not enter properties where they do not have permission.

# 5.0 Conclusion

The USDA APHIS WS program requests that EPA deny the petition to cancel product registration of sodium cyanide in the M-44 and sodium fluoroacetate (Compound 1080) in the Livestock Protection Collar (LPC). These products are important elements of integrated predation management programs to protect livestock and other resources. The M-44 and LPC are selective and target specific, and their release into the environment and risk to the public is minimal. APHIS WS employs operating procedures including directions from the labels and use restrictions that minimize the likelihood of exposure to people and domestic animals. Rigorous inventory and reporting procedures are utilized to account for the safe, effective use and secure storage of these materials.

APHIS WS is authorized by Congress to manage a program to reduce human/wildlife conflicts, such as predation to domestic livestock, throughout the United States. APHIS WS uses an Integrated Wildlife Damage Management (IWDM) approach which encompasses the integration and application of all approved methods of wildlife damage prevention and management, including the use of sodium cyanide capsules in the M-44 and sodium fluoroacetate in the LPC. Use of M-44s and LPCs is restricted by the EPA, APHIS WS Policy, state and federal laws and regulations, agreements with landowners, label instructions, use restrictions for M-44, and user instructions outlined in a technical bulletin for the LPC. The LPC targets coyotes that are in the act of killing a sheep or goat. The use pattern of the M-44, whereby it is imbedded in the ground with a lure to attract canids, maximizes its selectivity. APHIS WS use of M-44s and LPCs has resulted in only a very limited number of incidents involving people and domestic dogs. Specialized techniques for wildlife population management in IWDM such as the use of M-44s and LPCs are usually applied by APHIS WS professionals. However, IWDM programs implemented by APHIS WS are often complimented by activities conducted by landowners such as predator exclusion techniques, habitat modifications, harassment of predators with noise and visual stimuli, and a wide range of other nonlethal methods. The M-44 and LPC are selective and useful in specific situations where other methods are less appropriate. Their collective value is not measured by the number of animals taken, but rather by their targeted use in professionally applied programs.

In accordance with NEPA, APHIS WS has analyzed the use of sodium cyanide and sodium fluoroacetate, and their potential environmental impacts in a programmatic Environmental Impact Statement (EIS) and in numerous Environmental Assessments. APHIS WS partners closely with the FWS to assess and mitigate potential impacts to threatened and endangered species, and operates under specific guidelines that have been agreed to between FWS and APHIS WS pursuant to the Endangered Species Act and other federal and state wildlife conservation laws, regulations, and policies. APHIS WS has not jeopardized the existence of any threatened or endangered species, or any other species, with the use of M-44s or LPCs.

The currently registered sodium cyanide and sodium fluoroacetate pesticide products are important elements of APHIS WS' integrated predator damage management programs. In addition to EPA regulations, use of these products is subject to NEPA, state laws, and USDA policies and procedures. We believe that when used appropriately by APHIS WS professionals according to EPA label directions, these products do not pose unreasonable risk to people, domestic animals, or the environment.

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## Appendix 2. Abbreviations and Acronyms

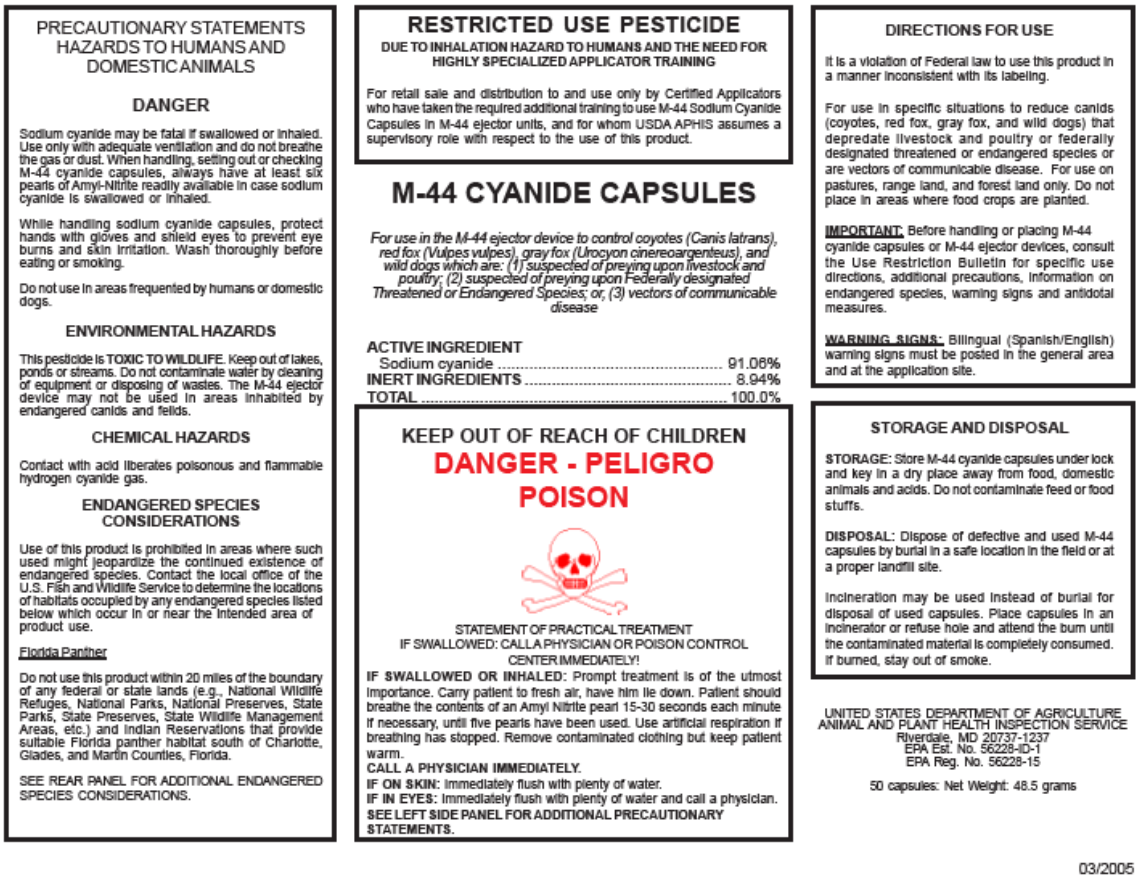
| | |
|---|---|
| APHIS | Animal and Plant Health Inspection Service |
| BLM | Bureau of Land Management |
| BO | Biological Opinion |
| CEU | Continuing Education Units |
| CMITS | Controlled Materials Inventory Tracking System |
| DPS | Distinct Population Segment |
| EA | Environmental Assessment |
| EIS | Environmental Impact Statement |
| EPA | United States Environmental Protection Agency |
| ESA | Endangered Species Act |
| FIFRA | Federal Insecticide, Fungicide, and Rodenticide Act |
| FR | Federal Register |
| FWS | U.S. Fish and Wildlife Service |
| FY | Federal Fiscal Year (October 1-September 30) |
| GAO | United States General Accounting Office |
| GDP | Gross Domestic Product |
| GYA | Greater Yellowstone Area |
| IDFG | Idaho Department of Fish and Game |
| IWDM | Integrated Wildlife Damage Management |
| LPC | Livestock Protection Collar |
| MFWP | Montana Fish, Wildlife and Parks Department |
| MIS | Management Information System |
| MOU | Memorandum of Understanding |
| NaCN | Sodium Cyanide |
| NASS | National Agricultural Statistics Service |
| NEPA | National Environmental Policy Act |
| NMDA | New Mexico Department of Agriculture |
| NRM | Northern Rocky Mountain |
| NWRC | APHIS WS National Wildlife Research Center |
| OCFO | USDA Office of the Chief Financial Officer |
| OIG | USDA Office of Inspector General |
| PCA | Primary Conservation Area |
| PDM | Predator Damage Management |
| PDR | Program Data Report |
| SOP | Standard Operating Procedures |
| T&E | Threatened and Endangered |
| TMN/MN | Thousand Method Nights / Method Nights |
| TRI | Toxic Release Inventory |
| USC | United States Code |
| USDA | United States Department of Agriculture |
| USDI | United States Department of Interior |
| WHO | World Health Organization |
| WS | USDA APHIS Wildlife Services |
| X/N | Experimental-Nonessential Population Area |

## Appendix 3. Scientific names of wildlife species mentioned in the document.

| Species | Scientific Name | Species | Scientific Name |
|---|---|---|---|
| Mammals - Carnivores | | Mammals – Other Species | |
| Virginia Opossum | *Didelphis virginiana* | White-collared Peccary | *Tayassu angulatus* |
| Arctic Fox | *Alopex lagopus* | Feral Pig | *Sus scrofa* |
| Coyote | *Canis latrans* | Mule Deer | *Odocoileus hemionus* |
| Domestic Dog | *Canis familiaris* | White-tailed Deer | *Odocoileus virginianus* |
| Gray Wolf | *Canis lupus* | Pronghorn | *Antilocapra americana* |
| - Eastern Timber Wolf | *- C. l. lycaon* | Bighorn Sheep | *Ovis canadensis* |
| - Mexican Gray Wolf | *- C. l. baylei* | Prairie Dogs | *Cynomys spp.* |
| - N. Rocky Mtn. Wolf | *- C. l. irremotus* | Utah Prairie Dog | *Cynomys parvidens* |
| Common Gray Fox | *Urocyon cinereoargenteus* | Woodchuck | *Marmota monax* |
| Kit Fox | *Vulpes macrotis* | North American Beaver | *Castor canadensis* |
| - San Joaquin Kit Fox | *- V. m. mutica* | Kangaroo Rats | *Dipodomys spp.* |
| Swift Fox | *Vulpes velox* | Deer Mice | *Peromyscus spp.* |
| Red Fox | *Vulpes vulpes* | Snowshoe Hare | *Lepus americanus* |
| - European Red Fox | *- V. v. vulpes* | Birds | |
| - Sierra Nevada Red Fox | *- V. v. necator* | Cackling Goose | *Branta hutchinsii* |
| Domestic House Cat | *Felis domesticus* | - Aleutian Cackling Goose | *B. h. leucopareia* |
| Mountain Lion | *Felis concolor* | Ring-necked Pheasant | *Phasianus colchicus* |
| Jaguarundi | *Herpailurus yagouaroundi* | Greater Sage-Grouse | *Centrocercus urophasianus* |
| Ocelot | *Leopardus pardalis* | Gunnison Sage-Grouse | *Centrocercus minimus* |
| Lynx | *Lynx lynx* | Sharp-tailed Grouse | *Tympanuchus phasianellus* |
| Bobcat | *Lynx rufus* | - Columbian S-t Grouse | *- T. p. columbianus* |
| Jaguar | *Panthera onca* | Black Vulture | *Coragyps atratus* |
| Striped Skunk | *Mephitis mephitis* | California Condor | *Gymongyps californianus* |
| Hog-nosed Skunk | *Conepatus leuconotus* | Bald Eagle | *Haliaeetus leucocephalus* |
| Black-footed Ferret | *Mustela nigripes* | Rock Pigeon | *Columba livia* |
| North American Badger | *Taxidea taxus* | Western Scrub-Jay | *Aphelocomacalifornica* |
| Ringtail | *Bassariscus astutus* | American Crow | *Corvus. brachyrhynchos* |
| Raccoon | *Procyon lotor* | Chihuahuan Raven | *Corvus cryptoleucus* |
| American Black Bear | *Ursus americanus* | Common Raven | *Corvus corax* |
| Brown Bear | *Ursus arctos* | European Starling | *Sturnus vulgaris* |
| - Grizzly Bear | *- U.a. horribilis* | Reptiles | |
| | | Desert Tortoise | *Gopherus agassizii* |

## Appendix 4. M-44 LABELS:

### A) EPA Reg. No. 56228-15 for coyotes, red fox, gray fox, and wild dogs



PRECAUTIONARY STATEMENTS
HAZARDS TO HUMANS AND DOMESTIC ANIMALS

**DANGER**

Sodium cyanide may be fatal if swallowed or inhaled. Use only with adequate ventilation and do not breathe the gas or dust. When handling, setting out or checking M-44 cyanide capsules, always have at least six pearls of Amyl-Nitrite readily available in case sodium cyanide is swallowed or inhaled.

While handling sodium cyanide capsules, protect hands with gloves and shield eyes to prevent eye burns and skin irritation. Wash thoroughly before eating or smoking.

Do not use in areas frequented by humans or domestic dogs.

**ENVIRONMENTAL HAZARDS**

This pesticide is **TOXIC TO WILDLIFE**. Keep out of lakes, ponds or streams. Do not contaminate water by cleaning of equipment or disposing of wastes. The M-44 ejector device may not be used in areas inhabited by endangered canids and felids.

**CHEMICAL HAZARDS**

Contact with acid liberates poisonous and flammable hydrogen cyanide gas.

**ENDANGERED SPECIES CONSIDERATIONS**

Use of this product is prohibited in areas where such used might jeopardize the continued existence of endangered species. Contact the local office of the U.S. Fish and Wildlife Service to determine the locations of habitats occupied by any endangered species listed below which occur in or near the intended area of product use.

Florida Panther

Do not use this product within 20 miles of the boundary of any federal or state lands (e.g., National Wildlife Refuges, National Parks, National Preserves, State Parks, State Preserves, State Wildlife Management Areas, etc.) and Indian Reservations that provide suitable Florida panther habitat south of Charlotte, Glades, and Martin Counties, Florida.

SEE REAR PANEL FOR ADDITIONAL ENDANGERED SPECIES CONSIDERATIONS.

**RESTRICTED USE PESTICIDE**
**DUE TO INHALATION HAZARD TO HUMANS AND THE NEED FOR HIGHLY SPECIALIZED APPLICATOR TRAINING**

For retail sale and distribution to and use only by Certified Applicators who have taken the required additional training to use M-44 Sodium Cyanide Capsules in M-44 ejector units, and for whom USDA APHIS assumes a supervisory role with respect to the use of this product.

## M-44 CYANIDE CAPSULES

*For use in the M-44 ejector device to control coyotes (Canis latrans), red fox (Vulpes vulpes), gray fox (Urocyon cinereoargenteus), and wild dogs which are: (1) suspected of preying upon livestock and poultry; (2) suspected of preying upon Federally designated Threatened or Endangered Species; or, (3) vectors of communicable disease*

| | |
|---|---|
| **ACTIVE INGREDIENT** | |
| Sodium cyanide | 91.06% |
| **INERT INGREDIENTS** | 8.94% |
| **TOTAL** | 100.0% |

KEEP OUT OF REACH OF CHILDREN
**DANGER - PELIGRO**
**POISON**

STATEMENT OF PRACTICAL TREATMENT
IF SWALLOWED: CALL A PHYSICIAN OR POISON CONTROL CENTER IMMEDIATELY!

**IF SWALLOWED OR INHALED:** Prompt treatment is of the utmost importance. Carry patient to fresh air, have him lie down. Patient should breathe the contents of an Amyl Nitrite pearl 15-30 seconds each minute if necessary, until five pearls have been used. Use artificial respiration if breathing has stopped. Remove contaminated clothing but keep patient warm.
**CALL A PHYSICIAN IMMEDIATELY.**
**IF ON SKIN:** Immediately flush with plenty of water.
**IF IN EYES:** Immediately flush with plenty of water and call a physician.
**SEE LEFT SIDE PANEL FOR ADDITIONAL PRECAUTIONARY STATEMENTS.**

**DIRECTIONS FOR USE**

It is a violation of Federal law to use this product in a manner inconsistent with its labeling.

For use in specific situations to reduce canids (coyotes, red fox, gray fox, and wild dogs) that depredate livestock and poultry or federally designated threatened or endangered species or are vectors of communicable disease. For use on pastures, range land, and forest land only. Do not place in areas where food crops are planted.

**IMPORTANT:** Before handling or placing M-44 cyanide capsules or M-44 ejector devices, consult the Use Restriction Bulletin for specific use directions, additional precautions, information on endangered species, warning signs and antidotal measures.

**WARNING SIGNS:** Bilingual (Spanish/English) warning signs must be posted in the general area and at the application site.

**STORAGE AND DISPOSAL**

**STORAGE:** Store M-44 cyanide capsules under lock and key in a dry place away from food, domestic animals and acids. Do not contaminate feed or food stuffs.

**DISPOSAL:** Dispose of defective and used M-44 capsules by burial in a safe location in the field or at a proper landfill site.

Incineration may be used instead of burial for disposal of used capsules. Place capsules in an incinerator or refuse hole and attend the burn until the contaminated material is completely consumed. If burned, stay out of smoke.

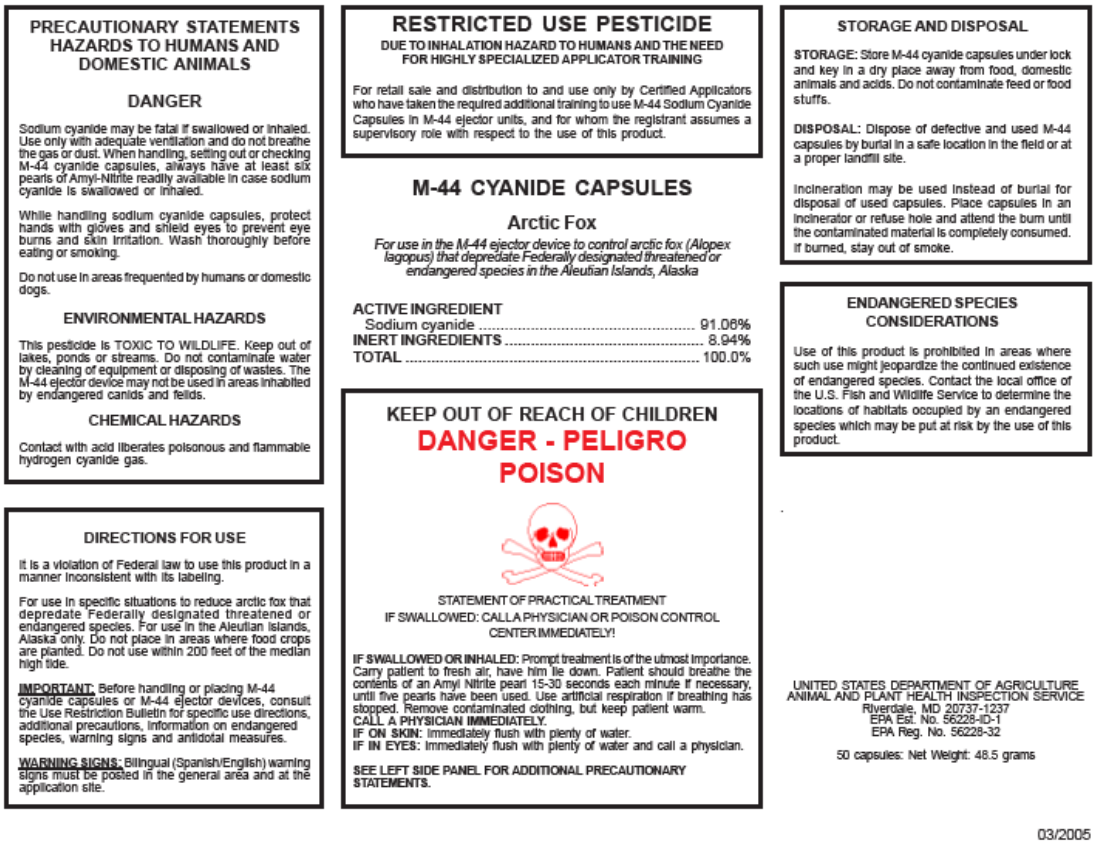
UNITED STATES DEPARTMENT OF AGRICULTURE
ANIMAL AND PLANT HEALTH INSPECTION SERVICE
Riverdale, MD 20737-1237
EPA Est. No. 56228-ID-1
EPA Reg. No. 56228-15

50 capsules: Net Weight: 48.5 grams

03/2005

**Appendix 4 (continued). M-44 LABELS:**

**A) EPA Reg. No. 56228-32 for arctic fox**



PRECAUTIONARY STATEMENTS
HAZARDS TO HUMANS AND DOMESTIC ANIMALS

DANGER

Sodium cyanide may be fatal if swallowed or inhaled. Use only with adequate ventilation and do not breathe the gas or dust. When handling, setting out or checking M-44 cyanide capsules, always have at least six pearls of Amyl-Nitrite readily available in case sodium cyanide is swallowed or inhaled.

While handling sodium cyanide capsules, protect hands with gloves and shield eyes to prevent eye burns and skin irritation. Wash thoroughly before eating or smoking.

Do not use in areas frequented by humans or domestic dogs.

ENVIRONMENTAL HAZARDS

This pesticide is TOXIC TO WILDLIFE. Keep out of lakes, ponds or streams. Do not contaminate water by cleaning of equipment or disposing of wastes. The M-44 ejector device may not be used in areas inhabited by endangered canids and felids.

CHEMICAL HAZARDS

Contact with acid liberates poisonous and flammable hydrogen cyanide gas.

DIRECTIONS FOR USE

It is a violation of Federal law to use this product in a manner inconsistent with its labeling.

For use in specific situations to reduce arctic fox that depredate Federally designated threatened or endangered species. For use in the Aleutian Islands, Alaska only. Do not place in areas where food crops are planted. Do not use within 200 feet of the median high tide.

IMPORTANT: Before handling or placing M-44 cyanide capsules or M-44 ejector devices, consult the Use Restriction Bulletin for specific use directions, additional precautions, information on endangered species, warning signs and antidotal measures.

WARNING SIGNS: Bilingual (Spanish/English) warning signs must be posted in the general area and at the application site.

RESTRICTED USE PESTICIDE
DUE TO INHALATION HAZARD TO HUMANS AND THE NEED FOR HIGHLY SPECIALIZED APPLICATOR TRAINING

For retail sale and distribution to and use only by Certified Applicators who have taken the required additional training to use M-44 Sodium Cyanide Capsules in M-44 ejector units, and for whom the registrant assumes a supervisory role with respect to the use of this product.

M-44 CYANIDE CAPSULES

Arctic Fox

*For use in the M-44 ejector device to control arctic fox (Alopex lagopus) that depredate Federally designated threatened or endangered species in the Aleutian Islands, Alaska*

| ACTIVE INGREDIENT | |
|---|---|
| Sodium cyanide | 91.06% |
| INERT INGREDIENTS | 8.94% |
| TOTAL | 100.0% |

KEEP OUT OF REACH OF CHILDREN
DANGER - PELIGRO
POISON

STATEMENT OF PRACTICAL TREATMENT
IF SWALLOWED: CALL A PHYSICIAN OR POISON CONTROL CENTER IMMEDIATELY!

**IF SWALLOWED OR INHALED:** Prompt treatment is of the utmost importance. Carry patient to fresh air, have him lie down. Patient should breathe the contents of an Amyl Nitrite pearl 15-30 seconds each minute if necessary, until five pearls have been used. Use artificial respiration if breathing has stopped. Remove contaminated clothing, but keep patient warm.
CALL A PHYSICIAN IMMEDIATELY.
**IF ON SKIN:** Immediately flush with plenty of water.
**IF IN EYES:** Immediately flush with plenty of water and call a physician.

**SEE LEFT SIDE PANEL FOR ADDITIONAL PRECAUTIONARY STATEMENTS.**

STORAGE AND DISPOSAL

**STORAGE:** Store M-44 cyanide capsules under lock and key in a dry place away from food, domestic animals and acids. Do not contaminate feed or food stuffs.

**DISPOSAL:** Dispose of defective and used M-44 capsules by burial in a safe location in the field or at a proper landfill site.

Incineration may be used instead of burial for disposal of used capsules. Place capsules in an incinerator or refuse hole and attend the burn until the contaminated material is completely consumed. If burned, stay out of smoke.

ENDANGERED SPECIES CONSIDERATIONS

Use of this product is prohibited in areas where such use might jeopardize the continued existence of endangered species. Contact the local office of the U.S. Fish and Wildlife Service to determine the locations of habitats occupied by an endangered species which may be put at risk by the use of this product.

UNITED STATES DEPARTMENT OF AGRICULTURE
ANIMAL AND PLANT HEALTH INSPECTION SERVICE
Riverdale, MD 20737-1237
EPA Est. No. 56228-ID-1
EPA Reg. No. 56228-32

50 capsules: Net Weight: 48.5 grams

03/2005

**Appendix 5. M-44 USE-RESTRICTIONS**

M-44 Cyanide Capsules
M-44 Use Restrictions
EPA Registration No. 56228-15
June 10, 1999

1. Use of the M-44 device shall conform to all applicable Federal, State, and local laws and regulations.

2. Applicators shall be subject to such other regulations and restrictions as may be prescribed from time-to-time by the U.S. Environmental Protection Agency (EPA).

3. Each applicator of the M-44 device shall be trained in : (1) safe handling of the capsules and device, (2) proper use of the antidote kit, (3) proper placement of the device, and (4) necessary record keeping.

4. M-44 devices and sodium cyanide capsules shall not be sold or transferred to, or entrusted to the care of any person not supervised or monitored, by the Animal and Plant Health Inspection Service (APHIS), Wildlife Services (WS) or any agency not working under an WS cooperative agreement.

5. The M-44 device shall only be used to take wild canids: (1) suspected of preying on livestock or poultry; (2) suspected of preying on Federally designated threatened or endangered species; or (3) that are vectors of a communicable disease.

6. The M-44 device shall not be used solely to take animals for the value of their fur.

7. The M-44 device shall only be used on or within 7 mile of a ranch unit of allotment where losses due to predation by wild canids are occurring or where losses can be reasonably expected to occur based upon recurrent prior experience of predation on the ranch unit or allotment. Full documentation of livestock depredation, including evidence that such losses were caused by wild canids, will be required before applications of the M-44 are undertaken. This use restriction is not applicable when wild canids are controlled to protect Federally designated threatened or endangered species or are vectors of a communicable disease.

8. The M-44 device shall not be used: (1) in areas within national forests or other Federal lands set aside for recreational use, (2) areas where exposure to the public and family and pets is probable, (3) in prairie dog towns, or (4) except for the protection of Federally designated threatened or endangered species, in National or State Parks; National or State Monuments; federally designated wilderness areas; and wildlife refuge areas.

**Appendix 5 (continued). M-44 USE-RESTRICTIONS**

9. The M-44 device shall not be used in areas where federally listed threatened or endangered animal species might be adversely affected. Each applicator shall be issued a map, prepared by or in consultation with the U.S. Fish and Wildlife Service, which clearly indicates such areas.

10. One person other that the individual applicator shall have knowledge of the exact placement location of all M-44 devices in the field.

11. In areas where more than one governmental agency is authorized to place M-44 devices, the agencies shall exchange placement information and other relevant facts to ensure that the maximum number of M-44s allowed is not exceeded.

12. The M-44 device shall not be placed within 200 feet of any lake, stream, or other body of water, provided that natural depression areas which catch and hold rainfall for short periods of time shall not be considered "bodies of water" for purposes of this restriction.

13. The M-44 device shall not be placed in areas where food crops are planted.

14. The M-44 device shall be placed at least at a 50-foot distance or at such a greater distance from any public road or pathway as may be necessary to remove it from sight of persons and domestic animals using any such public road or pathway.

15. The maximum density of M-44's placed in any 100 acre pasture land areas shall not exceed 10; and the density in any 1 square mile of open range shall not exceed 12.

16. No M-44 device shall be placed within 30 feet of a livestock carcass used as a draw station. No more than four M-44s devices shall be placed per draw station and no more than five draw stations shall be operated per square mile.

17. Supervisors of applicators shall check the records, warning signs, and M-44 devices of each applicator at least once a year to verify that all applicable laws, regulations, and restrictions are being strictly followed.

18. Each M-44 device shall be inspected at least once every week, weather permitting access, to check for interference or unusual conditions and shall be serviced as required.

19. Damaged or nonfunctional M-44 devices shall be removed from the field.

20. An M-44 device shall be removed from an area if, after 30 days, there is no sign that a target predator has visited the site.

21. All persons authorized to possess and use sodium cyanide capsules and M-44 devices shall store such capsules and devices under lock and key.

22. Used sodium cyanide capsules shall be disposed of by deep burial or at a proper landfill site.

**Appendix 5 (continued). M-44 USE-RESTRICTIONS**

Incineration may be used instead of burial for disposal. Place the capsules in an incinerator or refuse holes and burn until the capsules are completely consumed. Capsules may be incinerated using wither wood or diesel fuel.

23. Bilingual warning signs in English and Spanish shall be used in all areas containing M-44 devices. All such signs shall be removed when M-44 devices are removed.

a. Main entrances or commonly used access points to areas in which M-44 devices are set shall be posted with warning signs to alert the public to the toxic nature of the cyanide and to the danger to pets. Signs shall be inspected weekly to ensure their continued presence and ensure that they are conspicuous and legible.

b. An elevated sign shall be placed within 25 feet of each individual M-44 device warning persons not to handle the device.

24. Each authorized or licensed applicator shall carry an antidote kit on his person when placing and/or inspecting M-44 devices. The kit shall contain at least six pearls of amyl nitrite and instructions on their use. Each authorized or licensed applicator shall also carry on his person instructions for obtaining medical assistance in the event of accidental exposure to sodium cyanide.

25. In all areas where the use of the M-44 device is anticipated, local medical people shall be notified of the intended use. This notification may be through a poison control center, local medical society, the Public Health Service, or directly to a doctor or hospital. They shall be advised of the anti-dotal and first-aid measures required for treatment of cyanide poisoning. It shall be the responsibility of the supervisor to perform this function.

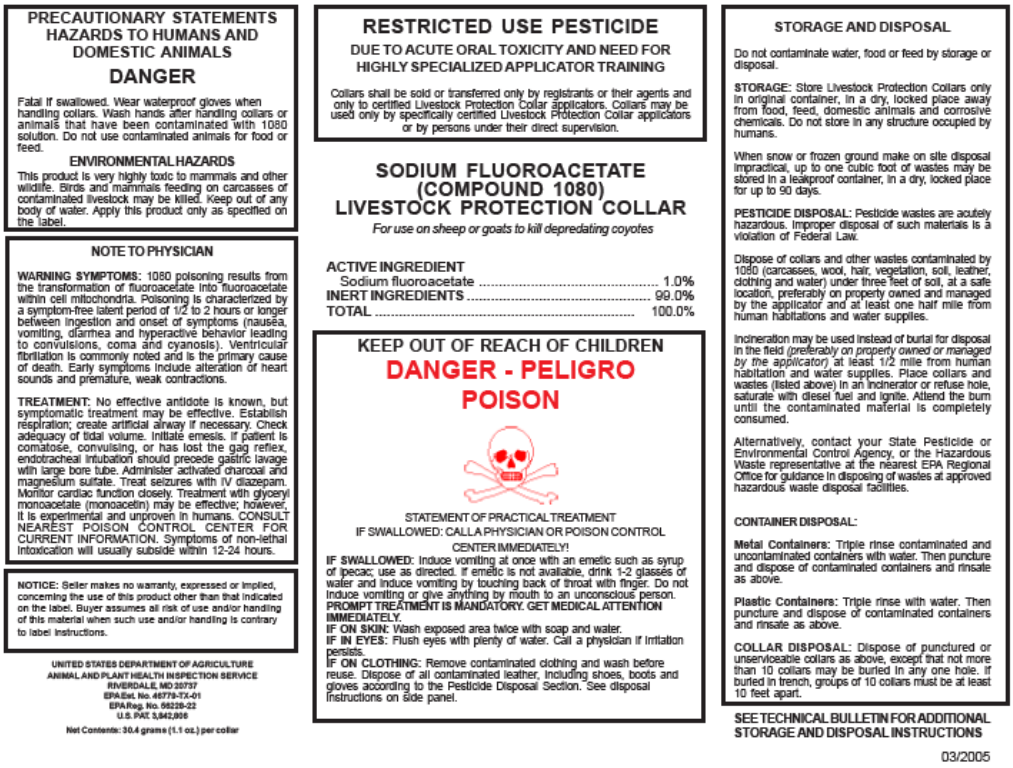
26. Each authorized M-44 applicator shall keep records dealing with the placement of the device and the results of each placement. Such records shall include, but need not be limited to:

a. The number of devices placed.
b. The location of each device placed.
c. The date of each placement, as well as the date of each inspection.
d. The number and location of devices which have been discharged and the apparent reason for each discharge.
e. Species of all animals taken.
f. All accidents or injuries to humans or domestic animals.

U.S. Department of Agriculture
Animal and Plant Health Inspection Service
Riverdale, MD 20737-1237
June 10, 1999

## Appendix 6. LPC Label

### LPC LABEL



PRECAUTIONARY STATEMENTS
HAZARDS TO HUMANS AND DOMESTIC ANIMALS

DANGER

Fatal if swallowed. Wear waterproof gloves when handling collars. Wash hands after handling collars or animals that have been contaminated with 1080 solution. Do not use contaminated animals for food or feed.

ENVIRONMENTAL HAZARDS

This product is very highly toxic to mammals and other wildlife. Birds and mammals feeding on carcasses of contaminated livestock may be killed. Keep out of any body of water. Apply this product only as specified on the label.

NOTE TO PHYSICIAN

**WARNING SYMPTOMS:** 1080 poisoning results from the transformation of fluoroacetate into fluoroacetate within cell mitochondria. Poisoning is characterized by a symptom-free latent period of 1/2 to 2 hours or longer between ingestion and onset of symptoms (nausea, vomiting, diarrhea and hyperactive behavior leading to convulsions, coma and cyanosis). Ventricular fibrillation is commonly noted and is the primary cause of death. Early symptoms include alteration of heart sounds and premature, weak contractions.

**TREATMENT:** No effective antidote is known, but symptomatic treatment may be effective. Establish respiration; create artificial airway if necessary. Check adequacy of tidal volume. Initiate emesis. If patient is comatose, convulsing, or has lost the gag reflex, endotracheal intubation should precede gastric lavage with large bore tube. Administer activated charcoal and magnesium sulfate. Treat seizures with IV diazepam. Monitor cardiac function closely. Treatment with glyceryl monoacetate (monoacetin) may be effective; however, it is experimental and unproven in humans. CONSULT NEAREST POISON CONTROL CENTER FOR CURRENT INFORMATION. Symptoms of non-lethal intoxication will usually subside within 12-24 hours.

**NOTICE:** Seller makes no warranty, expressed or implied, concerning the use of this product other than that indicated on the label. Buyer assumes all risk of use and/or handling of this material when such use and/or handling is contrary to label instructions.

UNITED STATES DEPARTMENT OF AGRICULTURE
ANIMAL AND PLANT HEALTH INSPECTION SERVICE
RIVERDALE, MD 20737
EPA Est. No. 46779-TX-01
EPA Reg. No. 56228-22
U.S. PAT. 3,842,806

Net Contents: 30.4 grams (1.1 oz.) per collar

RESTRICTED USE PESTICIDE

DUE TO ACUTE ORAL TOXICITY AND NEED FOR HIGHLY SPECIALIZED APPLICATOR TRAINING

Collars shall be sold or transferred only by registrants or their agents and only to certified Livestock Protection Collar applicators. Collars may be used only by specifically certified Livestock Protection Collar applicators or by persons under their direct supervision.

SODIUM FLUOROACETATE
(COMPOUND 1080)
LIVESTOCK PROTECTION COLLAR

*For use on sheep or goats to kill depredating coyotes*

| | |
|---|---|
| ACTIVE INGREDIENT | |
| Sodium fluoroacetate | 1.0% |
| INERT INGREDIENTS | 99.0% |
| TOTAL | 100.0% |

KEEP OUT OF REACH OF CHILDREN

DANGER - PELIGRO

POISON

STATEMENT OF PRACTICAL TREATMENT

IF SWALLOWED: CALL A PHYSICIAN OR POISON CONTROL CENTER IMMEDIATELY!

**IF SWALLOWED:** Induce vomiting at once with an emetic such as syrup of ipecac; use as directed. If emetic is not available, drink 1-2 glasses of water and induce vomiting by touching back of throat with finger. Do not induce vomiting or give anything by mouth to an unconscious person. **PROMPT TREATMENT IS MANDATORY. GET MEDICAL ATTENTION IMMEDIATELY.**
**IF ON SKIN:** Wash exposed area twice with soap and water.
**IF IN EYES:** Flush eyes with plenty of water. Call a physician if irritation persists.
**IF ON CLOTHING:** Remove contaminated clothing and wash before reuse. Dispose of all contaminated leather, including shoes, boots and gloves according to the Pesticide Disposal Section. See disposal instructions on side panel.

STORAGE AND DISPOSAL

Do not contaminate water, food or feed by storage or disposal.

**STORAGE:** Store Livestock Protection Collars only in original container, in a dry, locked place away from food, feed, domestic animals and corrosive chemicals. Do not store in any structure occupied by humans.

When snow or frozen ground make on site disposal impractical, up to one cubic foot of wastes may be stored in a leakproof container, in a dry, locked place for up to 90 days.

**PESTICIDE DISPOSAL:** Pesticide wastes are acutely hazardous. Improper disposal of such materials is a violation of Federal Law.

Dispose of collars and other wastes contaminated by 1080 (carcasses, wool, hair, vegetation, soil, leather, clothing and water) under three feet of soil, at a safe location, preferably on property owned and managed by the applicator and at least one half mile from human habitations and water supplies.

Incineration may be used instead of burial for disposal in the field *(preferably on property owned or managed by the applicator)* at least 1/2 mile from human habitation and water supplies. Place collars and wastes (listed above) in an incinerator or refuse hole, saturate with diesel fuel and ignite. Attend the burn until the contaminated material is completely consumed.

Alternatively, contact your State Pesticide or Environmental Control Agency, or the Hazardous Waste representative at the nearest EPA Regional Office for guidance in disposing of wastes at approved hazardous waste disposal facilities.

**CONTAINER DISPOSAL:**

**Metal Containers:** Triple rinse contaminated and uncontaminated containers with water. Then puncture and dispose of contaminated containers and rinsate as above.

**Plastic Containers:** Triple rinse with water. Then puncture and dispose of contaminated containers and rinsate as above.

**COLLAR DISPOSAL:** Dispose of punctured or unserviceable collars as above, except that not more than 10 collars may be buried in any one hole. If buried in trench, groups of 10 collars must be at least 10 feet apart.

**SEE TECHNICAL BULLETIN FOR ADDITIONAL STORAGE AND DISPOSAL INSTRUCTIONS**

03/2005

**Appendix 7. Photographs: A) M-44 and setting tool, and B) M-44 set for field use**

**A)**

**(USDA Photo)**

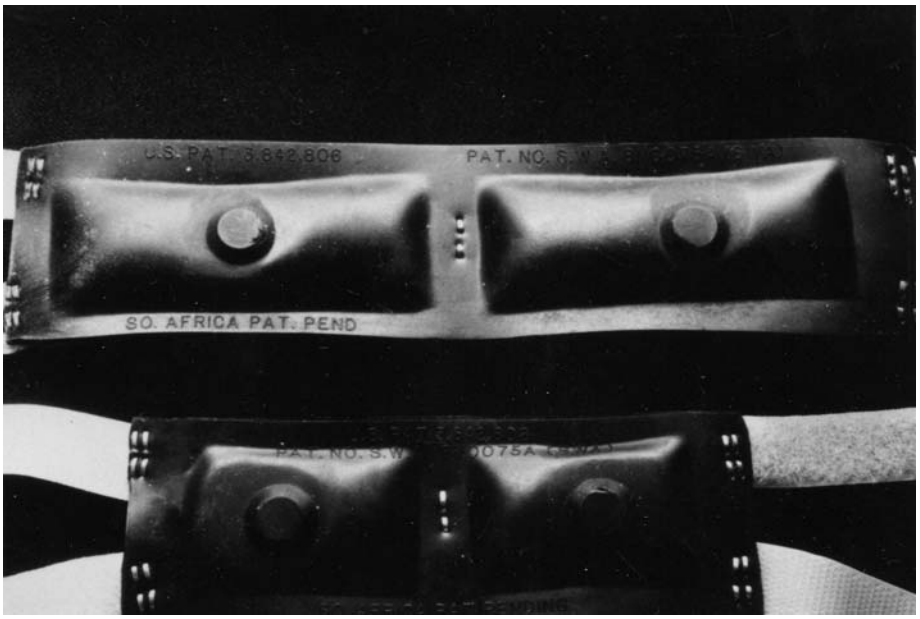
**Appendix 7 (continued). Photographs: A) M-44 and setting tool, and B) M-44 set for field use**

**B)**


(USDA Photo)

**Appendix 8. Photographs: A) LPC, and B) LPC on a Sheep**

A)




(USDA Photo)

B)

(USDA Photo)

**Appendix 9. Data tables and analysis process associated with discussion of economic issues of Marin County nonlethal predator program.**

This Appendix contains some data reported in Shwiff et al. (2006).

The Marin County, California Nonlethal Plan Program participation details/cost sharing for improvements and nonlethal methods:

1. Ranchers with more than 2,000 sheep would be eligible for up to $2,000 in annual cost-share funds
2. Ranchers with less than 2,000 but greater than 200 sheep would be eligible for up to $500 in annual share funds.
3. To participate, ranchers would contact the Agricultural Commissioner's Office to initiate a site review, to determine the amount of nonlethal cost share funds to be granted to the rancher.
4. A claim form, plus any receipts, for reimbursement of expenditures for facilities improvements would then be submitted by the rancher in cooperation with the Commissioner's staff member. (Examples of reimbursable improvements were predator deterrent fencing, lambing sheds, and guard animals.)

Marin County, California Program participation details/indemnity payments:

1. To receive indemnification payments, ranchers notified the Commissioner's Office with the date, location, manner of loss, predator, numbers of animals killed, and other information.
2. The Commissioner, County Livestock Advisor, or County Humane Society, at their discretion, may conduct a site visit and verify the loss.
3. The rancher must then send in a signed claim form and a payment was made at the livestock market price, dependent upon available funds.

Table A. Marin County Nonlethal Plan Program summary information.

| Year | # of Ewes in Program | Total # of Ewes in Marin County | Total Improve Reimb. | Predation loss | Indemnity | Indemnity/ # predated | Total |
|---|---|---|---|---|---|---|---|
| 1 | 4156 | 6040 | $29,886 | 95 | $6,650 | $70 | **$36,536** |
| 2 | 4918 | 6040 | $31,004 | 236 | $19,350 | $82 | **$50,354** |

Table B. Estimation of predation rates for Marin County Nonlethal Plan Program.

| Year | Scenario | Estimated Production rates | Estimated no. of lambs produced | Program Predation loss | Resulting predation rate % |
|---|---|---|---|---|---|
| 1 | A | 1:1 | 4156 | 95 | 2.3% |
| | B | 1.5:1 | 6234 | 95 | 1.5% |
| | C | 1.75:1 | 7273 | 95 | 1.3% |
| 2 | A | 1:1 | 4918 | 236 | 4.8% |
| | B | 1.5:1 | 7377 | 236 | 3.2% |
| | C | 1.75:1 | 8607 | 236 | 2.7% |

**Appendix 9 (continued). Data tables and analysis process associated with discussion of economic issues of Marin County nonlethal predator program.**

Table C. Extension of Marin Plan as a replacement program for USA sheep protection.

| Year | Ewes 1 year or older in | | Improve. | Indemnity costs at | | Total (reimb + indemnity) | |
|---|---|---|---|---|---|---|---|
| | USA* | Program | Reimb. | 1.5% | 4.0% | 1.5% | 4.0% |
| 1 | 6,185,000 | 4,267,650 | $30,684,404 | $6,721,549 | $17,924,130 | **$37,405,952** | **$48,608,534** |
| | | | | **3.2%** | **4.0%** | **3.2%** | **4.0%** |
| **2** | 6,185,000 | 5,009,850 | $31,562,055 | $19,716,732 | $24,645,915 | **$51,278,787** | **$56,207,970** |

*NASS 2007

Table D. Extension of Marin Plan as a replacement program for USA beef cattle protection.

| | Beef cows in the | | Improvement | | | |
|---|---|---|---|---|---|---|
| Year | USA* | Program | Reimb. | Predation | Indemnity | Total |
| 1 | 33,350,000 | 22,947,450 | $165,016,242 | 229,475 | $97,526,664 | **$262,542,906** |
| 2 | 33,350,000 | 27,154,851 | $171,189,305 | 407,323 | $173,112,175 | **$344,301,480** |

*NASS 2007

Table E. Total cost of Marin Plan as a replacement program for sheep and beef cattle protection in the USA.

| Year | Total sheep + cattle (Marin pred rates) | Total sheep + cattle (National pred rates) |
|---|---|---|
| **1** | **$299,948,858** | **$311,151,439** |
| **2** | **$395,580,266** | **$400,509,449** |

## Appendix 10. Human exposure to sodium cyanide as a result of M-44 discharge

| Month | Year | State | WS Employee | Public Citizen | Use Cite | Circumstance | Evidence of WS Misuse | Amyl Nitrate Used | Medical Treatment Sought | Symptoms | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Nov. | 1983 | TX | Yes | No | Unknown | Accidental discharge | Unknown | Unknown | Unknown | Unknown | From a TX summary Report (5/10/2000) |
| Jul. | 1987 | TX | Yes | No | Rangeland | Accidental discharge | No | Yes | Yes | Chest pains, vision blurred, vomiting | WS Specialist was exposed to sodium cyanide in the face when leaning over to bait the M-44. |
| Oct | 1988 | TX | Yes | No | Unknown | Unknown | Unknown | Unknown | Unknown | Unknown | From a TX summary Report (5/10/2000), Exposure to M-44 content |
| Oct. | 1988 | NM | Yes | No | Unknown | Accidental discharge | No | Unknown | No | Temporary irritation in one eye | Premature firing of device and combination of wind allowed cyanide to contact face. |
| Jan. | 1989 | TX | Yes | No | Unknown | Accidental discharge | Unknown | Unknown | Unknown | Unknown | From a TX summary Report (5/10/2000), discharged while moving device |
| Jan. | 1989 | TX | Yes | No | Unknown | Accidental discharge | Unknown | Unknown | Unknown | Unknown | From a TX summary Report (5/10/2000), Exposure to M-44 content |
| Mar | 1989 | TX | Yes | No | Unknown | Unknown | Unknown | Unknown | Unknown | Unknown | From a TX summary Report (5/10/2000), content exposed to face |
| Nov. | 1989 | ID | Yes | No | Rangeland | Accidental discharge | No | | Yes | Chemical burn in eyes | Immediately after setting the M-44, it went off and sodium cyanide entered into the specialist's eyes and caused significant damage to eye. The doctor's report shows that 16 days post exposure the eye looked healed. |
| Oct. (Unknown) | 1989 | OK | Yes | No | Rangeland | Accidental discharge | No | Yes | Unknown | First and second degree burns in eye | Just set an M-44 when it went off and struck him in the face. |
| Feb. | 1990 | NM | Yes | No | Unknown | Accidental discharge | No | Unknown | Yes | Unknown | M-44 was being reset and accidentally discharged. Cyanide hit face and eye. |
| Jan. | 1991 | TX | Yes | No | Unknown | Accidental discharge | Unknown | Unknown | Unknown | Unknown | From a TX summary Report (5/10/2000) |
| May | 1991 | NM | Yes | No | Rangeland | Accidental discharge | No | Yes | No | None | Sodium cyanide struck arm, face and lips, employee held breath, wiped mouth, and was wearing eye glasses. |
| Mar | 1992 | ND | Yes | No | Ranch | Accidental discharge | No | Yes | Yes | None | While removing the M-44 it went off and sodium cyanide stuck employee and clothing. |
| Jul. | 1993 | TX | Yes | No | Unknown | Accidental discharge | Unknown | Unknown | Unknown | Unknown | From a TX summary Report (5/10/2000) |

| Month | Year | State | WS Employee | Public Citizen | Use Cite | Circumstance | Evidence of WS Misuse | Amyl Nitrate Used | Medical Treatment Sought | Symptoms | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Aug. | 1994 | TX | Yes | No | Unknown | Accidental discharge | Unknown | Unknown | Unknown | Unknown | From a TX summary Report (5/10/2000), Exposure to M-44 content |
| Nov. | 1995 | TX | Yes | No | Unknown | Accidental discharge | Unknown | Unknown | Unknown | Unknown | From a TX summary Report (5/10/2000), Exposure to M-44 content |
| Jan. | 1997 | UT | Yes | No | Rangeland | Checking M-44 | No | Unknown | Yes | Eye irritation | When M-44 went off, some sodium cyanide particles went in eyes (was wearing eye protection). |
| Aug. | 1999 | NM | Yes | No | Rangeland | Accidental discharge | No | Yes | No | Nauseous | Accidentally bumped M-44 with stake puller while brushing away weeds. Sodium cyanide covered palm of their hand, some sodium cyanide also got on shirt and glasses. |
| Oct | 1999 | TX | Yes | No | Unknown | Unknown | Unknown | Unknown | Unknown | Unknown | From a TX summary Report (5/10/2000) |
| Oct. | 1999 | TX | Yes | No | Rangeland | Employee setting the device | No | Yes | Yes | Dryness in mouth, coughing, tightening of muscles | Employee was setting device when it went off and contents hit him in the arm and face. Was wearing safety glasses. Six amyl nitrate capsules were administered, 2 by employee, 4 by medical personnel. |
| May | 2001 | VA | Yes | No | Farm | Possibly struck M-44 with hoe | No | Yes | Yes | Stinging , burning pain in eye, bitter taste in mouth, cyanide blisters | Employee was draining water that had accumulated around M-44 with the hoe side of a hammer, may have struck device. Had head turned, wearing safety glasses |
| Mar | 2002 | NM | Yes | No | Rangeland | Accidental discharge | Yes | Unknown | Yes | None | Employee was improperly transporting a loaded M-44 (in a bucket in pickup) When he reached for the unit, it went off |
| Apr. | 2005 | NM | Yes | No | Pasture | Accidental discharge | No | Yes | No | None | Just finished baiting M-44 when it went off. Tasted and smelled cyanide, took capsules |
| Jan. | 2007 | OK | Yes | No | Pasture | Accidental discharge | No | Yes | Yes | Burning eye | Removing ice from around device, ejector went off and sodium cyanide hit him in the eye |
| | | | | | | | | | | | |
| Mar | 1978 | OR | No | Yes | Rangeland | Tampering/ Trespass | No | Unknown | Yes | None (No symptoms were reported by the boy, father or doctor.) | After stopping dogs from licking M-44, boy kicked M-44 with foot. Cyanide cloud went over his head and some got in mouth and nose. He then dug the M-44 out of the ground and took it home. |

| Month | Year | State | WS Employee | Public Citizen | Use Cite | Circumstance | Evidence of WS Misuse | Amyl Nitrate Used | Medical Treatment Sought | Symptoms | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| June | 1990 | NM | No | Yes | Rangeland | Dog pull, with subsequent exposure to human | No | Yes | Yes | General illness | Dog pulled M-44, ran over to person and made mouth-to-mouth contact. The person reported loss of breath, swollen tongue, fast heart rate, numbness of lips, and curling of fingers. Flushed mouth, nose and eyes with water. |
| Sept. | 1993 | UT | No | Yes | Rangeland | Accidentally discharged by bumping it when hunting | No | No | Yes | Generally feeling bad | Person was hunting and crouched low because he heard a noise. He apparently bumped the device with his hand. The M-44 went off in his hand. |
| Aug. | 1993 | OR | No | Yes | Rangeland | Accidental discharge | No | No | No | None | Person stepped on M-44 and contents hit his face. He washed his face and eyes and went back to work. No lingering symptoms. |
| June | 1994 | NM | No | Yes | Rangeland | Accidental discharge or possible tampering | No | Yes | Yes | None | Field worker struck the M-44 with a hoe (possibly intentionally). The said it was accidental and occurred while either sharpening his hoe or jumping a ditch. |
| Oct. | 1994 | OR | No | Yes | Rangeland | Dog Pull | No | No | No | After at least 15 minutes the person reported racing heart, light headed, nausea, tunnel vision, near fainting. | Person bent over exposed dog and inhaled deeply. Person reached into dogs mouth to clear windpipe (dog was foaming at the mouth) and the dog bit her. Person attempted CPR using a plastic tube down the dog's throat. Reported long term chronic health effects. |
| Mar | 1995 | ID | No | Yes | Unknown | Intentional Pull | No | No | Yes | Bad taste in mouth | Hunter poked the M-44 with a stick |
| May | 1999 | VA | No | Yes | Unknown | Person touched a dog alleged to have been exposed to M-44 | Unknown | No | No | Sunburn' irritation | After touching the dog, the person touched his own face and felt a 'sunburn' type of irritation immediately. He did not wash any part of his body for 12 hours. The sunburn irritation comes and goes sometimes as often as 2 to 8 times a day. The dog did not have any orange marking dye on it. Owner did not wash for 12 hours after touching dog |
| Oct. | 1999 | UT | No | Yes | Rangeland | Dog Pull/Trespass | No | No | No | None | Human reported to be 20' away from the M-44 when dog pulled device. Dog died. Human alleged he was exposed, sketchy human exposure documentation |

| Month | Year | State | WS Employee | Public Citizen | Use Cite | Circumstance | Evidence of WS Misuse | Amyl Nitrate Used | Medical Treatment Sought | Symptoms | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sept. | 1999 | NE | No | Yes | Corn Field (Field was being managed as a pasture for gazing) | Intentional Pull | No | No | Yes | Strange taste, No symptoms reported | Person was placing an electric fence on leased ground and wanted to place a fence post where an M-44 was located. He used pliers in an attempt to pull the M-44 out of the ground. Discharged into air. |
| Sept. | 2000 | UT | No | Yes | Unknown | Unintentional tampering | No | No | Yes | None | Surveyor accidentally pulled M-44 thinking it was a survey marker. Sodium cyanide hit sleeve |
| Jan. | 2002 | NE | No | Yes | Pasture | Tampering | No | No | Yes | Cloudy vision | Rancher was placing a concrete block on the M-44 to protect dogs, when it went off. Some cyanide went in eye. |
| Nov. | 2002 | NM | No | Yes | Rangeland | Tampering/ Trespass | No | No | Yes | Increased respiration, slight burning in eyes | Woman tampered with the M-44, trying to remove it with gloved hand and a garbage bag. |
| May | 2003 | UT | No | Yes | Unknown | Unintentional tampering | See comment | No | Yes | Dizzy, vomiting, headache, burning eyes, tingling lips. | WS investigation concluded that if an M-44 was pulled, it was not a WS M-44. It may have been an illegal set brought in from WY. |
| May | 2007 | TX | No | Yes | Pasture | Accidental discharge / Trespass | No | No | Yes | Burning, irritated eyes | Mosquito control employee accidentally kicked or stepped on the M-44. Sodium cyanide powder went into his eyes. |

**Appendix 11. Domestic dog exposure to sodium cyanide (NaCN) as a result of a M-44 discharge**

| Month-Year | State | Dog Breed | Use Site | Circumstance | Evidence of Misuse | Outcome | Comments |
|---|---|---|---|---|---|---|---|
| 1967-1972 | NA | 3 unidentified dogs | NA | NA | NA | NA | 3 dogs reported; believed to be 3 incidents resulting in 3 dog deaths |
| Apr-90 | NM | NA | rangeland | Dog off lead with ranch hand | no | died | dog pulled M-44 and run up to ranch hand |
| Oct-94 | OR | unknown | pasture | confusion regarding the location of the entrance to the property; lessee did not notify land owner of the M-44 operation | no | died | USDA Initiated a formal written agreement for lessees M-44 predator management actions |
| Feb-97 | OR | NA | NA | NA | NA | died | dog presumed dead |
| Jan-98 | NA | NA | NA | NA | NA | died | dog presumed dead |
| Feb-98 | NA | NA | NA | NA | NA | died | dog presumed dead |
| Mar-98 | UT | unknown | rangeland | citizen released dog in an M-44 area | no | died | warning sings apparent |
| Dec-98 | OR | great Pyrenees | pasture | dog running at large | no | died | leash laws in effect |
| Jan-99 | ID | 2 hounds | cropland - harvested alfalfa | dog owner trespassed onto private property | no | died | |
| Mar-99 | CO | boxer mix | rangeland/ pasture | M-44s accidentally placed on property without an agreement | yes | died | M-44s were placed on the wrong property |
| Mar-99 | ID | collie mix | rangeland/pasture | landowner & stock dog approached area of M-44s. One dog pulled an M-44 | no | died | dog/land owner was aware of the M-44s |
| Mar-99 | VA | German shepherd mix and yellow lab | pasture | 2 dog roaming & unsupervised four miles from home. | no | shepherd died, lab survived | leash law broken; may have been illegally running deer/bear |
| Mar-99 | OR | lab | grass field | dog running at large | no | survived | leash laws in effect |
| Sep-99 | OR | blue heeler | noncrop | dog escaped pen and went across the road | no | died | The dog was unavailable for confirmation of exposure |
| Sep-99 | VA | mixed hound | rangeland/ pasture | hunting | yes | died | M-44s were to be removed by 9/1 as per the VA EA, and the WS employee thought the date was 10/1 |
| Oct-99 | UT | unknown | rangeland | trespassing on posted private property. | no | died | |
| Dec-99 | NM | 2 German shorthairs | rangeland/ pasture | hunting, running at large | no | 2 died | hunters trespassing on private property. |
| Jan-00 | NM | unknown | rangeland/ pasture | | no | died | |
| Jan-00 | OR | German shepherd | cropland - trees | dog running at large on nonadjacent property | no | died | blood and liver samples (presumable post mortem) detected "low levels" of cyanide |
| May-00 | NA | border collie | pasture | | no | died | |
| Apr-01 | NA | NA | rangeland/ pasture | dog running at large; trespassing | no | died | |
| May-01 | NA | NA | rangeland | dog running at large; on adjacent property | no | died | lab tests done - results not available |
| Feb-02 | OR | German shepherd | pasture | dog running at large; on adjacent property | no | died | adjoining property owner received prior notification by land owner |

| Month-Year | State | Dog Breed | Use Site | Circumstance | Evidence of Misuse | Outcome | Comments |
|---|---|---|---|---|---|---|---|
| Feb-02 | NA | lab | pasture | lost control of dog and it strayed | no | died | adjoining property owner received prior notification by land owner |
| Feb-02 | NA | NA | rangeland/ pasture | unknown | no | died | 2/5/2002 |
| Feb-02 | NA | mix | pasture | dog roaming & unsupervised - went to adjacent property. | no | died | adjoining property owner received prior notification by land owner |
| Feb-02 | NA | unknown | pasture | dog running at large | no | died | |
| Jan-04 | NA | mix | rangeland | dog accompanied by owner; dog owner ignored sign | no | died | |
| Feb-04 | NA | Irish setter | pasture | dog roaming & unsupervised - went to adjacent property. | no | died | |
| Mar-04 | NA | mix | pasture | dog roaming & unsupervised - went to adjacent property. | no | died | owner later concluded an M-44 was the likely cause of death |
| Mar-04 | NA | German shepherd | rangeland | dog running at large | no | died | collar- no tags |
| Mar-05 | NA | blue heeler | | dog roaming & unsupervised - went to adjacent property. | no | died | adjoining property owner received prior notification by land owner |
| Mar-05 | NA | Australian shepherd mix | rangeland | dog roaming & unsupervised - went to adjacent property. | no | died | adjoining property owner received prior notification by land owner |
| Apr-05 | NA | red border collie | pasture | dog strayed; dog owner was aware of M-44 placement | no | died | |