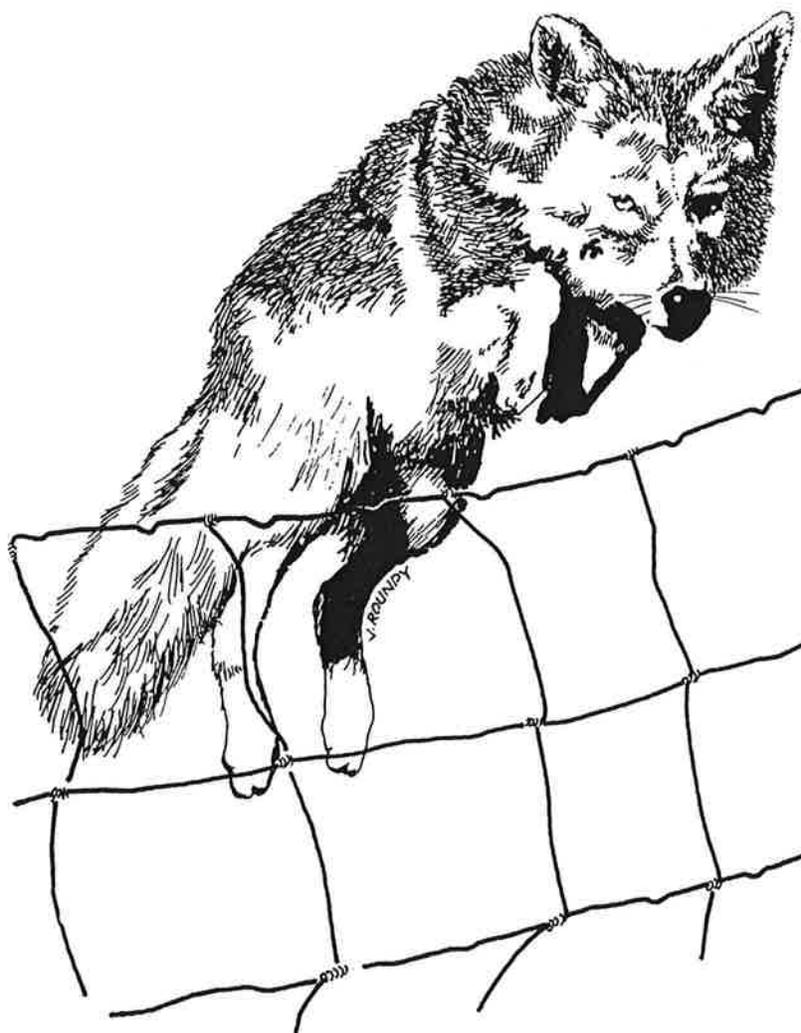


REGULATORY PEST CONTROL

PESTICIDE APPLICATION
AND
SAFETY TRAINING
STUDY GUIDE



UTAH DEPARTMENT OF AGRICULTURE

DIVISION OF PLANT INDUSTRY

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STUDY GUIDE FOR REGULATORY PEST CONTROL

The educational material in this study guide is practical information to prepare you to meet the written test requirements. It doesn't include all the things you need to know about this pest-control subject or your pest-control profession. It will, however, help you prepare for your tests.

Contributors include the Utah Department of Agriculture and Utah State University Extension Service. This study guide is based on a similar one published by the Nebraska Department of Agriculture. The information in this manual was adapted from the following sources: Aerial Application, Cooperative Extension Service, University of Wisconsin. 1993. Aerial Applicator Training Manual, Cooperative Extension Service, University of Florida. 1992. Pattern Your Ag Spray Plane, Cooperative Extension Service, University of Arkansas. Agriculture Aircraft Calibration and Setup for Spraying, Cooperative Extension Service, Kansas State University. 1992. Aerial Application of Pesticides, Cooperative Extension Service, University of Georgia. 1992. Aerial Pest Control for commercial/noncommercial pesticide applicators (category 12): Aerial Application is adapted with permission from Iowa Commercial Pesticide Applicator Manual, Category 11, Aerial Application, published by Iowa State University. Editors were: Clyde L. Ogg, Extension Assistant, and Larry D. Schulze, Extension Pesticide Coordinator, University of Nebraska. Special thanks to William W. Lyon, Director of Operations, Department of Aeronautics for providing valuable comments after reviewing this manual.

The information and recommendations contained in this study guide are based on data believed to be correct. However, no endorsement, guarantee or warranty of any kind, expressed or implied, is made with respect to the information contained herein.

Other topics that may be covered in your examinations include First Aid, Personal Protective Equipment (PPE), Protecting the Environment, Pesticide Movement, Groundwater, Endangered Species, Application Methods and Equipment, Equipment Calibration, Insecticide Use, Application, Area Measurements, and Weights and Measures. Information on these topics can be found in the following books:

1. *Applying Pesticides Correctly: A guide for Private and Commercial Applicators*. U.S. EPA, USDA and Extension Service, revised 1991.
2. *Applying Pesticides Correctly: A Supplemental Guide for Private Applicators*. U.S. EPA, USDA and Extension Service, December 1993, Publication E-2474.

These books can be obtained from the Utah Department of Agriculture or Utah State University Extension Service. Please contact your local Utah Department of Agriculture field representative or Utah State University extension agent.

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DO'S AND DON'TS FOR THE LIVESTOCK PROTECTION COLLAR

DO

- Read the label and instructions before using collars.
- Plan how to target coyotes to your collared animals before using collars.
- Use the appropriate size of collar: small collar for 15-50 lb. animals, large collar for animals over 50 lbs.
- Be sure to position collars correctly.
- Check and repair fences if necessary before putting collared animals in pasture.
- Notify neighbors that collars can be hazardous to free-ranging pets.
- Keep warning signs in place as long as collars are being used.
- Check collared animals weekly or more often to be sure that all are present and collars are in position and not punctured.
- Properly dispose of all collars, animals, vegetation, soil, water, leather clothing, and containers contaminated by 1080.
- Report any suspected poisoning of nontarget animals or humans.
- Minimize human activity in pastures where collars are being used.
- Keep records up-to-date as directed in the labeling.
- Take collars off when predation has stopped, or is not expected to occur.
- Store collars properly when not in use.
- Wear waterproof gloves when handling the collars.
- Wash your hands with soap and water after handling collars.

DON'T

- Waste time by placing collared animals where coyotes won't attack them.
- Use collars if your livestock can be protected more easily or economically by other measures.
- Use so few collared animals that coyotes won't find them.

- Use more than twenty (20) collars in any 100-acre or smaller pasture, or more than fifty (50) collars per section (640 acres) of pasture.
- Use collars on unfenced, open range.
- Use contaminated animals for food or feed.
- Use leaking or damaged collars.
- Remove toxicant from collar.
- Use until you have consulted U.S. Fish and Wildlife Services to determine in which counties collar use has been prohibited or requires written permission in areas of Threatened and Endangered Species.

SECTION I USER INSTRUCTIONS

A. Introduction and Theory

The Livestock Protection Collar, invented by Roy McBride of Alpine, Texas, exploits the coyote's habit of killing sheep and goats by bites to the throat. As described in McBride's U.S. Patent No. 3,482,806 (issued in 1974), coyotes that attack collared livestock usually bite through the collars and receive oral doses of the contents. When used with a toxicant such as sodium fluoroacetate (Compound 1080), Livestock Protection Collars kill the attacking coyotes. Collars may be used only by specifically certified Livestock Protection Collar applicators or persons under their direct supervision. This publication is intended for the instruction of collar applicators.

Coyotes' attacking and feeding behavior do not seem to be affected by the presence of Livestock Protection Collars. Attacking coyotes usually kill and feed upon collared animals just as they would if no collar were present. After a lethal dose of sodium fluoroacetate (Compound 1080) has been ingested, symptoms of intoxication typically do not appear for two or more hours. Death occurs from two to seven hours (average 4 hours 20 minutes) after the collar is punctured.

When collars are used properly, coyotes may puncture them in 75 percent or more of their attacks. A 100 percent puncture rate is unlikely to be achieved because coyotes sometimes attack body sites other than the throat.

Effective use of Livestock Protection Collars requires not only that collars be positioned correctly, but also that coyote attacks be directed or targeted to collared livestock. Targeting may be difficult or impossible under some conditions. If coyotes are killing less than once per week, the collar technique may be impractical. Collars are recommended for ranches with high rates of coyote predation and management conditions that permit effective targeting of predations to collared livestock.

Experienced persons usually can evaluate local conditions quickly to decide whether or not collars will be effective. In addition to the basic problem of targeting, other factors to consider in deciding whether or not to use collars include availability and effectiveness of other control methods; costs of collars; labor requirements to collar and monitor livestock; potential hazards of collars to humans, domestic animals including pets, and non-target wildlife; and severity of predation.

B. Toxic Properties of Sodium Fluoroacetate (Compound 1080)

Compound 1080 is highly toxic to warm-blooded animals, including man, when taken internally. Humans are not likely to be poisoned except by ingestion of collar contents. Based on available estimates of toxicity (0.7-2.1 mg/kg), a lethal dose for a 150-pound man would be contained in 5 to 14 ml of collar solution. Each Livestock Protection Collar (contents 30 ml) contains two to six lethal doses. Before using collars, carefully read the label and the Use Restrictions contained in Section II of this publication (Appendix A contains the Material Safety Data Sheet for the Livestock Protection Collar).

The toxic solution in the Livestock Protection Collars contains a yellow dye (Tartrazine) which is used as a safety marker. Punctured, damaged, or broken collars together with clothing, animal remains, vegetation, soil, or other materials marked by this dye must be cleaned and disposed of in accordance with the label and Sections I.D.5. and II.12,13. of this publication. Collars with minor damage to straps or fastenings may be repaired by applicators as long as the toxicant reservoirs have not been punctured and do not leak.

Compound 1080 is hazardous to domestic animals including livestock and pets. Dogs are particularly susceptible. In field studies, dogs have died after they attacked collared livestock and punctured the collars. As little as 0.1 ml of collar contents may be fatal to a 25-pound dog. Dogs could be poisoned by scavenging the carcasses of collared livestock. Therefore, to minimize the potential hazard to dogs, promptly dispose of all livestock carcasses as well as coyote carcasses suspected of being poisoned by Compound 1080 according to instructions contained in this publication.

Pen studies have shown that an adult sheep can be fatally poisoned by eating forage containing as little as 1 ml of 1080 solution from Livestock Protection Collars. Although no livestock appeared to have been poisoned by eating contaminated vegetation during the five years of field testing, it could happen. Therefore, contaminated forage must be disposed of as directed on the product labeling.

C. Description of Collars

The Livestock Protection Collar is a rubber bladder that contains a solution of Compound 1080, with neck straps for attachment to a sheep or goat. The type of collar used most up to 1985, has two Velcro[®] neck straps (0.75 inches wide and 22-25 inches long on new collars). Three-strap models also are available and are intended for use on goats. Both two-strap and three-strap collars have two toxicant reservoirs and come in two sizes, small and large. The small collar is intended for use on lambs and kids weighing from 15 to 50 pounds. Livestock Protection Collars are not recommended for small animals (under 15 lbs). The large collar is designed for use on large lambs and kids as well as for adult sheep and goats.

D. Management of Collars on Sheep and Goats

1. Things to do before putting collars on livestock:

Be sure you have enough collars of the proper size.

Inspect all collars for leaks and inspect straps to be sure they are securely attached. Do not use leaking or torn

collars or collars on which the straps are coming loose. Loose straps may be reattached by sewing.

Check the fence around the pasture where collared animals are to be placed and repair as necessary to keep animals within the pasture.

Establish locations for warning signs (See Section II.10), and be sure you have enough signs.

Inform neighbors of your intent to use Livestock Protection Collars and advise them of the potential hazards to free-roaming dogs.

If ear tags or other marks are to be used, have the tags and related equipment on hand.

Have an emetic (one-ounce bottle of syrup of ipecac) available when collars are to be handled. Also have a few good-quality plastic bags or other leakproof containers on hand for packaging damaged collars.

Select and pen the target flock (animals to be collared).

2. Attaching collars

Hold collars up to the necks of target livestock to determine the size of collar needed for each animal. The rubber portion of the collar should come up to the ear. If the collar is too small, there will be an unprotected region below each ear. This will result in a lower puncture rate than would be obtained with collars of proper size.

One person can put collars on livestock, but the task is much easier for a two-person team. One person holds each animal while the other attaches its collar. To attach a collar, hold it in position under the animal's throat. Tighten the rear strap over the animal's neck just behind the ears and fasten it temporarily. Then tighten the front strap over the head between the eyes and ears and fasten it securely. Straps should be positioned to keep the rubber part of the collar directly below the ear. On goats with horns, the front straps may pass in front of both horns or in front of one horn and behind the other. If necessary, use string or twine to tie the front strap to one or both horns to keep the collar in position. Once the front strap is in position, readjust the rear strap if necessary and secure it. If the straps are longer than

needed, a knife or scissors can be used to trim off the excess. Fasten the strap ends by stapling.

Collar straps must be tight enough to prevent collars from slipping out of position, but not so tight as to choke the animal or cause sores. Each strap should be loose enough that the applicator can insert two fingers between the strap and the animal. Collars stay in place well on animals with wool or mohair, but may be difficult to keep in position on newly shorn or slick-necked animals, particularly goats. Head and neck conformation varies among animals and it may be impossible to keep collars in place on some individuals. They should be taken out of the collared flock.

A suitable method of permanently identifying individual animals in a target flock is required to keep track of collared livestock. One such method is the use of numbered ear tags. Tags that can be read from a distance of 50 feet or more are most useful. If you are using ear tags, attach them before the animal is collared.

When the collar is in place, release the animal into a corral or other confined area and observe it carefully. Listen for labored breathing that may indicate the collar is too tight. When first released, collared sheep and goats often shake their heads, rub, or make other attempts to rid themselves of the collars. This behavior will stop within a few hours if collars are not too tight. After you are satisfied that the collars are properly attached, move collared animals to the desired location.

Place warning signs at logical points of access.

After handling Livestock Protection Collars, wash your hands with soap and water.

3. Monitoring collared livestock

Once collared animals are in the desired location, the pasture should be checked every seven days or more often if frequent predation is expected. During each check, try to locate each animal and observe collars to be sure they are in position. If the collar has slipped out of position, catch the animal and reposition its collar. Inspect each animal's neck for yellow dye which could indicate a punctured or leaking collar. If the dye is seen, catch the animal and check the collar. Replace any damaged or leaking collars. See the label and Section I.D.5. and II.12. of this publication. Collars on small

kids or lambs may require periodic adjustment to allow for growth.

When searching for collared livestock, watch for both animal carcasses and congregations of scavenging birds that could indicate the locations of carcasses. Whenever you visit a pasture, record the identity of each collared animal seen. Check each warning sign weekly to ensure it is in place and is legible.

Based on experience gained in research studies, you will not see each collared animal every time you visit large, brushy pastures. Any animal not accounted for in two consecutive checks may be dead. An intensive search for it must be made. In addition, if more than three collared animals are not accounted for during any one check, an intensive search for these animals is required. Pastures must be systematically searched in their entirety or until the missing animals are located.

If more than nine collars and/or collared animals are unaccounted for during any 60-day period, remove all collars from animals and terminate their use. Seek technical advice if necessary to determine and correct the cause(s) of collar loss. Collar use may be resumed after adequate steps have been taken to prevent further excessive loss of collars.

Routine checks of collared livestock are difficult if the animals are secretive or wild. Feed concentrates can be used to train animals to come to you or your vehicle. This facilitates the identification and inspection of collared livestock. It also helps to have a few tame animals in the collared flock. Binoculars may be useful for inspecting collared livestock from a distance.

Infrequently, collars may be missing from carcasses of sheep or goats killed by coyotes. In research studies, missing collars appeared to have been carried or dragged away by coyotes. Some were found as far as a half mile away from kill sites, but about half of the missing collars were never recovered. Coyotes sometimes cache (hide or bury) them. Whenever a collar is missing, make a reasonable effort to find it. (see Section II.11).

If you see any animal other than the target animals (coyotes) that you think may have been poisoned, report it promptly to the Utah Department of Agriculture and

Food. Any suspected poisoning of Threatened or Endangered species must be reported immediately. (see Section II.6).

4. Handling collars and contaminated animal remains, vegetation, clothing, water, and soil.

The toxic solution in Livestock Protection Collars contains a yellow dye, Tartrazine, which is used as a marker for the presence of 1080 on punctured, damaged, or broken collars; on clothing, animal remains, vegetation, soil, or other materials; and in water. Always use waterproof gloves when handling collars or any materials known to be contaminated by 1080.

Inspect carcasses of collared animals to determine the cause of death. When the carcasses are fresh (within 24 hours after death), coyote kills usually are obvious. Remove punctured collars carefully and examine the punctures. Holes made by coyote teeth usually can be distinguished from accidental punctures. When collars are punctured by cactus thorns, the thorns sometimes remain in the holes.

If the collar was punctured, remove it carefully to minimize leakage and place in a leakproof plastic bag or other container for transport to the Utah Department of Agriculture and Food for disposal. If necessary, double-bag to prevent leakage. Examine the carcass for contamination as indicated by the yellow dye. Cut away the contaminated parts for disposal along with the punctured collar (see Section II.12, 13). Dispose of what remains of the carcass using your normal practice. Cut or dig up contaminated forage and soil and place them in a leakproof container for transport to the disposal site.

If the collar was not punctured, the applicator can reuse it on another animal. Dispose of the carcass using your normal practice. No special handling is required. If an unpunctured collar has only minor damage to the straps or fasteners, the applicator may repair it.

When predation has stopped, or when collars are to be taken off for other reasons such as shearing, gather the collared flock into a corral. Hold each animal and inspect its collar for punctures. Loosen the neck straps and pull them free. Do not pull so hard you rupture the collar. It may be necessary, particularly with Angora goats, to use a knife or scissors to free collar straps

from the animals' hair. Clean unpunctured collars as necessary and return them to locked storage until you need them again.

If clothing becomes contaminated with 1080 solution, remove it promptly. Wash clothes before wearing them again. Contaminated leather clothing, including gloves and footwear, should be disposed of in the same manner as contaminated animal remains because pesticides cannot be easily cleaned from leather (see Section II.13).

5. Disposal of damage collars and other contaminated materials

Damaged, punctured, or leaking livestock protection collars as well as contaminated animal remains, vegetation, soil, water, and leather clothing must be properly disposed of. The preferred method is by deep burial under three feet of soil in a safe field location at least one-half mile from human habitations and water supplies. For disposal on the ranch, it may be convenient to drill several deep holes using a mechanized post hole auger, or to make a trench with a backhoe. Then, as waste materials are produced, they can be dropped into the hole or trench and covered with earth.

Alternatively, contact your UDAF field representative for guidance in disposing of wastes at approved hazardous waste disposal facilities.

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.

E. Directing Coyote Predation to Collared Livestock

1. General comments

The process of directing coyote predation to collared livestock is called targeting. Knowledge of targeting is in its infancy and should improve as more people gain experience with Livestock Protection Collars. Three different approaches or targeting strategies are described here. Ranchers and predation control specialists are encouraged to apply these methods as necessary to achieve the best results in their own circumstances.

2. Targeting strategies

a. Collar all vulnerable livestock

Collaring all sheep or goats on a ranch would solve the targeting problem. This strategy has not been tested due to the cost of collars and the large number that would be required in large flocks (over 100 animals). Nevertheless, in small flocks (50 or fewer animals) it may be practical to collar all the lambs or kids. In flocks with 50 to 100 lambs or kids, it may be worthwhile to collar the smallest 20 to 50 individuals. Do not use more than 20 collars in any pasture under 100 acres, or more than 50 collars per square mile of fenced pasture.

b. Use target (collared) flocks

When coyotes are killing in particular pastures, remove all vulnerable livestock. Place 20 to 50 collared lambs or kids with their mothers in the pasture while all other vulnerable animals are penned at night or moved elsewhere. Add uncollared adult sheep or goats to the target flock to increase its total size to 50 or 100 head. If coyotes have been killing adult sheep or goats in the area, both adults and kids in the target flock should be collared. Remove collars 30 days after predation ceases, or when the risk of predation has abated.

This was the strategy used in most field tests and is the usual approach when collars are introduced onto a ranch where depredation is in progress. This strategy also can be employed by placing collared flocks in vacant pastures one or two months before large bands of sheep or goats arrive.

c. Collar vulnerable individuals in large flocks

Coyotes usually prefer kids or lambs to adult goats or sheep. Experience with Angora goats has shown that if a few collared kids are placed in wether or castrated male goat flocks (5-10 collared kids per 100 uncollared adults), coyotes will select the kids. This strategy has not been tested on sheep.

3. Mistakes in targeting

As with any new technique, one must learn how to use Livestock Protection Collars before optimum results can be expected. The following represents a list of common mistakes made by persons learning this technique.

a. Collars may be placed where effective targeting cannot be expected. In an example, 20 lambs were collared in a ewe-lamb flock containing hundreds of

lambs. Coyotes subsequently killed the uncollared lambs. Effective targeting did not occur because collared lambs were far outnumbered by uncollared lambs that were equally attractive to coyotes.

b. Collars are placed where predation is too infrequent. In one such case, collared sheep were exposed for four weeks during which no predation occurred. The users then lost interest and removed the collars. There was no further predation on this ranch for several months. Collars cannot be used effectively where there is little or no predation.

c. Target flocks are too small. In one example, six collared lambs were left alone in a one-section pasture. Coyotes passed through the pasture without finding the collared animals and then killed sheep from a large flock in an adjacent pasture. The larger the flock, the more likely it is to attract coyotes. The optimum size for target flocks has not been determined, but pastures of 100 acres or more should probably contain at least 50 head.

d. Target flocks are not isolated sufficiently from uncollared livestock. On one small farm, a group of ewes and collared lambs were exposed while other sheep on the place were penned each night. Instead of killing in the collared flock, coyotes switched to a neighbor's unprotected flock half a mile away. With small farm flocks, adjacent landowners may have to work together to achieve effective targeting.

e. Small collars are used on large sheep or goats, leaving the throat region inadequately covered. Coyotes frequently kill these animals without puncturing the collars.

f. Collars are attached improperly, or they slip out of position. Coyotes will kill these animals but are unlikely to puncture the collars.

g. Collars are placed on sick or cull animals in an effort to avoid sacrificing more valuable livestock. This may be false economy, as coyotes may not attack ill or lethargic animals. Collars should be used only on animals of the size and kind that coyotes have been killing locally.

h. Use of collars may be accompanied by increased human activity on the ranch. Coyotes are often wary of unusual activity and may temporarily stop killing because of it. Collars should be placed and monitored with a minimum of disruptive activity.

SECTION II USE RESTRICTIONS

1. Use of collars shall conform to all applicable federal, state, and local regulations.

2. 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.¹

The certified applicator is directly responsible for assuring that all use restrictions are met. The certified applicator will decide, in accordance with label directions, when and under what circumstances collars will be used. The certified applicator will either apply collars or be physically present where collars are applied by a noncertified person. However, the noncertified person who has received appropriate instructions from the certified applicator may store collars, check collars in the field, remove collars, repair or dispose of damaged collars in accordance with use restrictions, retrieve collars lying in the field, and properly dispose of contaminated material and animal carcasses.

3. Certification of applicators shall be performed by appropriate regulatory agencies. Prior to certification, each applicator shall receive training that will include, but need not be limited to:

a. Training in safe handling and attachment of collars.

b. Training in disposal of punctured or leaking collars, contaminated animal remains, contaminated vegetation and soil, and contaminated clothing.

¹ "Direct Supervision," as described in this restriction, conforms to the requirements established under 40 CFR 171.6.

c. Instructions for practical treatment of 1080 poisoning in humans and domestic animals.

d. Instructions on record keeping.

4. Registrants or their agents shall keep records of all collars sold or transferred at their address of record. Records shall include the name, address, state where Livestock Protection Collar certification was issued, certification number of each recipient, and dates and numbers of collars sold or transferred.

5. Each applicator shall keep records dealing with the use of Livestock Protection Collars and the results of such use. Records shall be maintained in accordance with appropriate State or Federal regulations but for not less than two years following disposal or loss of collars. Such records shall include, but need not be limited to:

a. The number of collars attached on livestock.

b. The pasture(s) where collared livestock were placed.

c. The dates of each attachment, inspection, and removal.

d. The number and locations of livestock found with ruptured or punctured collars and the apparent cause of the damage.

e. The serial number, dates, and approximate location of collars lost.

f. The species, locations, and dates of all animals suspected to have been killed by Livestock Protection Collars.

g. All suspected poisonings of humans, domestic animals or non-target wild animals resulting from collar use.

6. Any suspected poisoning of Threatened or Endangered Species must be reported immediately (within three days) to the Utah Department of Agriculture and Food, (801) 538-7123, as well as each suspected poisoning of humans, domestic animals or non-target wild animals.

7. Only the registrant or collar manufacturer is authorized to fill collars with 1080 solution. Certified applicators are not authorized to fill collars. Compound 1080 solution may not be removed from collars and used in any other way.

8. Collars shall only be used to take coyotes within fenced pastures. Fenced pastures include all pastures which are enclosed by livestock fencing. In addition to wire livestock fences, these may include other man-made fences, such as rock walls and natural barriers, such as escarpments, lakes, and large rivers, that will prevent escape of livestock. Collars shall not be used on unfenced, open range.

Use of Livestock Protection Collars shall be limited to fenced pastures no larger than 2,560 acres (four square miles). Larger fenced pastures, up to a maximum of 10,000 acres, may be treated where the average annual precipitation is less than 20 inches and vegetation of the pasture is sparse, nonforested, and restricted to short to midheight grasses and scattered shrubs.

Collared livestock shall not be placed in any pasture in which the applicator cannot monitor use in accordance with all other use restrictions. In no case shall collared livestock be placed in a pasture larger than 10,000 acres.

9. Collars shall be used only where losses of sheep or goats due to predation by coyotes are occurring or, based upon prior experience, where coyote predation can reasonably be expected to occur.

10. Where collars are in use, each logical point of access (e.g. gates, trails, etc.) shall be conspicuously posted with a bilingual (English and Spanish, or other second language appropriate for the region) warning sign not less than 8" x 10" in size. Such signs shall be inspected weekly to ensure their continued presence and legibility and will be removed when collars are removed. The signs will have a minimum type size for "DANGER - POISON" of 24 point (1/4 inch) with the remaining text at least 18 point (3/16 inch).

11. Check all collared livestock at least once every seven days and adjust collars if needed.

If any collared animal is not accounted for in two consecutive checks, an intensive search for it must be made.

In addition, if more than three collared animals are not accounted for during any one check, an intensive search for these animals is required.

If more than nine collars are unaccounted for during any 60-day period, remove all collars from animals and terminate their use. Do not resume use until adequate steps have been taken to prevent further, excessive loss of collars.

12. Damaged, punctured, or leaking collars shall be removed from the field for repair or proper disposal. Damaged collars shall be placed in leakproof containers while awaiting repair or proper disposal. Authorized collar repairs are limited to minor repairs of straps and fastenings. Properly dispose of leaking or punctured collars.

13. Dispose of 1080 wastes (contaminated leather clothing, animal remains, wool, hair, vegetation, water, and soil) under three feet of soil, at a safe location, preferably on property owned or managed by the applicator and at least ½ mile from human habitations and water supplies.

Alternatively, contact your state pesticide or Hazardous Waste representative at the nearest EPA Regional Office for guidance in disposing of wastes at approved hazardous waste disposal facilities.

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 90 days.

Metal Container: Triple rinse contaminated and uncontaminated containers with water. Puncture and dispose of contaminated container or rinsate as above.

Plastic Container: Triple rinse with water, then puncture and dispose of container and rinsate as above.

14. All persons authorized to possess and use Livestock Protection Collars shall store them under lock and key in a dry place away from food, feed, domestic animals, and corrosive chemicals. Livestock Protection Collars may be stored in outbuildings or storage areas attached to, but separate from, human living quarters. Collars shall not be stored in human living quarters.

15. The 1080 Livestock Protection Collar may not be used in the areas listed in Appendix B without written approval from the nearest U.S. Fish and Wildlife Service Office (FWS, Endangered Species Specialist). If the U.S. Fish and Wildlife Service or the user determines that the use of the collar may adversely impact an Endangered Species in the specific areas requested, the collar may not be used in these areas.

16. The number of collars used shall be the minimum necessary for effective livestock protection. For pastures of the following size classes, do not use more collars than the number indicated.

<u>SIZE IN ACRES</u>	<u>NUMBER OF COLLARS</u>
0 to 100	20
101 to 640	50
641 to 10,000*	100

*See Use Restriction 8.

17. Each applicator will have a one-ounce bottle of syrup of ipecac available when attaching, inspecting, removing, or disposing of collars.

18. No contaminated animal will be used for food or feed.

SECTION III APPENDICES

APPENDIX A

MATERIAL SAFETY DATA SHEET 1080 LIVESTOCK PROTECTION COLLAR

SECTION I. PRODUCT IDENTIFICATION

GENERAL OR GENERIC ID: Sodium Fluoroacetate (Compound 1080)
HAZARD CLASSIFICATION: Class B, Restricted Use Poison, Solid

SECTION II. HAZARDOUS COMPONENTS

INGREDIENTS: Sodium Fluoroacetate 90%
Extremely toxic to humans and animals, not absorbed through skin but can enter body through open wounds and inhalation.

SECTION III. PHYSICAL DATA

Boiling Point: None (Solid Material)
Vapor Pressure: Solid with extremely low vapor pressure, very hygroscopic
Specific Gravity: >1
Percent Volatiles: 0%

SECTION IV. FIRE AND EXPLOSION DATA

No Fire Hazard: Compound 1080 becomes unstable at 110°C and decomposes at 200°C.

SECTION V. HEALTH HAZARD DATA

PERMISSIBLE EXPOSURE LEVEL: Exposure must be kept to absolute minimum. Compound 1080 has LD₅₀ value of less than 100 mg/kg for humans.

EFFECTS OF EXPOSURE:

EYES: Can be absorbed through eyes. Do not let product come in contact with eyes.
SKIN: Product is not absorbed through skin. Do not let product come in contact with skin.
BREATHING: All inhalation of product should be avoided.
SWALLOWING: If swallowed, induce vomiting immediately.

FIRST AID:

IF ON SKIN: Wash the exposed area twice with soap and water.

IF IN EYES: Wash eyes with plenty of water for at least 15 minutes.

IF ON CLOTHING: Remove contaminated clothing and wash before reuse. Dispose of all contaminated leather, including shoes, boots and gloves according to Pesticide Disposal Section.

IF SWALLOWED: Induce vomiting immediately 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!**

NOTE TO PHYSICIAN:

WARNING SYMPTOMS: 1080 poisoning results from the transformation of fluoroacetate into fluorocitrate within cell mitochondria. Poisoning is characterized by a symptom-free latent period of ½ to 1 hour 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 or 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 functions closely. Treatment with glyceryl monacetate (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 to 24 hours.

SECTION VI. REACTIVITY DATA

STABILITY: Stable up to 110°C.

SECTION VII. SPILL OR LEAK

SMALL SPILL: Wash with large amounts of water.

LARGE SPILL:

IF LIQUID: Absorb as much liquid as possible with an absorbent (sand, clay, earth, or other floor absorbent) and shovel into container. Wash away remaining spill with very large amounts of water.

IF SOLID: Shovel solid into container and wash remaining spill away with very large amounts of water.

SECTION VIII. STORAGE AND DISPOSAL

DO NOT CONTAMINATE WATER, FOOD OR FEED BY STORAGE OR DISPOSAL.

STORAGE: Store Compound 1080 only in original container, in a dry locked place away from food and domestic animals.

DISPOSAL: Compound 1080 wastes are acutely hazardous. Improper disposal of excess pesticide is a violation of federal law. If these wastes cannot be disposed of by use according to label instructions, contact your state pesticide or environmental protection office, or the hazardous waste representative at the nearest EPA Regional Office for guidance.

CONTAINER DISPOSAL: Triple rinse (or equivalent). Then offer for recycling or reconditioning, or puncture and dispose of in a sanitary landfill or by other procedures approved by state and local authorities.

SECTION IX. PROTECTIVE EQUIPMENT

PROTECTIVE GLOVES: Wear rubber gloves whenever product is handled.

EYE PROTECTION: Chemical splash goggles should be worn whenever baits are mixed.

RESPIRATORY PROTECTION: NIOSH/MSHA-approved respirators for pesticides are advised while mixing Compound 1080 baits.

OTHER PROTECTIVE EQUIPMENT: To prevent repeated or prolonged skin contact, impervious clothing and boots are advised.

SECTION X. SPECIAL PRECAUTIONS AND OTHER COMMENTS

May be fatal if swallowed. Wear waterproof gloves when using Compound 1080. Wash hands after handling bait or animals that have been contaminated with 1080 solution. Do not use contaminated animals for food or feed.

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

The exposed bodies of all poisoned animals must be collected and destroyed by complete burning or deep burial at approved sites for hazardous wastes, where there will be little danger of contaminating water supplies. Include all dried carcasses in this recovery procedure since they may remain dangerous to dogs and cats for an indefinite period. A single mouse poisoned by 1080 may contain enough poison to kill an adult dog. This procedure also favors good sanitation and reduces objectional odors.

Compound 1080 is a restricted use pesticide for retail sale and use only by certified applicators or persons under direct supervision, and only for those uses covered by their certified applicator's certification.

The information accumulated herein is believed to be accurate but is not warranted to be whether originating with Tull Chemical Co., Inc. or not.

APPENDIX B

RESTRICTED USE AREAS 1080 LIVESTOCK PROTECTION COLLAR

STATE	COUNTIES OR AREAS	NEAREST FWS OFFICE/PHONE
California	Alameda, Contra Costa, Merced, San Joaquin, Santa Clara, and Stanislaus	Sacramento, California 916-979-2710
Idaho	Bonner, Boise (north of State Highway 21), Boundary, Clearwater, Custer (north of local road running from Sun Valley to Chilly and a corresponding line northeast from Chilly to Patterson), Fremont, Idaho, Lemhi, Shoshone, and Valley	Boise, Idaho 208-334-1931
Michigan	Keweenaw (Isle Royal) and entire Upper Peninsula	Twin Cities, Minnesota 612-725-3276
Minnesota	Aitkin, Becker, Beltrami, Carlton, Cass, Clearwater, Cook, Crow Wing, Hubbard, Itasca, Kittson, Koochiching, Lake, Lake of the Woods, Mahnomon, Marshall, Pennington, Pine, Roseau, and St. Louis	Twin Cities, Minnesota 612-725-3276
Montana	Beaverhead, Carbon, Flathead, Gallatin, Glacier, Lake, Lewis and Clark, Lincoln, Madison, Missoula, Park, Pondera, Powell, Sanders, Stillwater, Sweet Grass, and Teton	Helena, Montana 406-449-5322
Washington	Pend Oreille, Okanogan (National Park and Forest Land), Skagit, and Whatcom	Boise, Idaho 208-334-1931
Wisconsin	Douglas, Florence, Lincoln, Oneida, and Price	Twin Cities, Minnesota 612-725-3276
Wyoming	Fremont, Park, and Teton and Yellowstone National Parks	Helena, Montana 406-449-5322

M-44 TRAINING MANUAL

SECTION I INTRODUCTION

The Utah Department of Agriculture and Food (UDAF) recognizes that the ecological impact of predatory-animal control is very complex and will continue to develop solutions that provide for domestic livestock protection while maintaining environmental quality. The department acknowledges that predators are resources of inherent interest and value to the people of Utah and our nation but also recognizes the parallel need and responsibility for conducting predator control where resource-conflict situations develop. The assistance and cooperation of licensed M-44 applicators is an integral part of an overall predatory-animal control program. Their efforts to use the device safely and responsibly are deeply appreciated by the department and the livestock industry.

SECTION II ALTERNATIVE METHODS TO CONTROL COYOTE PREDATION

The M-44 device should not be considered the only method of coyote control. There are few pest problems that can be controlled with the use of a single control technique. The M-44 should be viewed as one tool among many to reduce predation to livestock. In most cases of livestock predation, the use and integration of several predator-control methods is necessary for effective predator control.

Predator management options can be divided into two general categories: (a) livestock husbandry and management and (b) predator management.

Livestock-husbandry techniques include various kinds of livestock confinement such as shed-lambing and night-penning. Other management techniques include alteration of lambing seasons, herding of sheep, and selective use of pastures to avoid areas of historic predation. Disposal of livestock carcasses may also help reduce predator preference for livestock.

Predator management includes non-lethal and lethal control methods. Non-lethal methods include fences such as mesh or net-wire fencing and electric fencing to exclude coyotes from a pasture. Use of guard animals has increased because they have proven effective in many situations. Animals used as guards include emus, ostriches, llamas, donkeys, mules, and a variety of dog breeds. Frightening devices such as one that combines a flashing strobe light and siren that operates at random intervals has proven beneficial. Lethal methods include aerial hunting; coyote calling; attracting coyotes with trained, domestic dogs; denning (killing the pups before they leave the den); fumigants (usually used to kill pups in the den); leghold traps; snares; the livestock protection collar; and the M-44 device.

Each of these techniques has advantages and disadvantages and the effectiveness varies with season of the year, location, available alternative food sources, and coyote abundance. For more information on predation control alternatives contact the USDA-APHIS-ADC program or the Utah Department of Agriculture and Food.

SECTION III LICENSING AND TRAINING FOR THE USE OF THE M-44 DEVICE IN UTAH

Users of the M-44 device and sodium cyanide capsules must be licensed by the Utah Department of Agriculture and Food. All applicators must undergo specialized training in the use of the M-44 device, pass a written examination with a minimum score of 70 percent, and pay a license fee. Training is provided by USDA-APHIS-ADC program personnel. Training sessions include instructions on safe handling of the capsules and device, proper use of the antidote kit, record-keeping requirements, and hands-on, in the field use of the device.

The material safety data sheet for the M-44 cyanide capsule is found in Appendix A. It is the responsibility and obligation of the licensed applicator to follow the

precautionary statements, directions for use, other pertinent information stated on the label, and the supplemental M-44 Use Restrictions.

SECTION IV TOXIC EFFECTS OF SODIUM CYANIDE

Sodium cyanide (NaCN) is highly toxic and dangerous if not handled properly. The LD₅₀ is one to two mg of NaCN per kg (2.2 lbs) of body weight. A quantity the size of a grain of rice can be fatal to most people. Toxic symptoms may occur if it is swallowed, inhaled as a dust, or absorbed through the skin. Sodium cyanide is a skin irritant and solutions of high concentrations may also act as a corrosive agent. In the presence of acids, sodium cyanide liberates highly toxic hydrogen cyanide (HCN) gas. Sodium cyanide in the presence of water also liberates HCN but at a slower rate.

Sodium cyanide is rapidly absorbed after being swallowed or inhaled as a dust. Skin absorption of sodium cyanide in amounts sufficient to cause poisoning is debatable. However, in the presence of perspiration, which is usually acidic, it may react to form hydrogen cyanide which is readily absorbed through the skin. In this manner, it can produce cyanide intoxication. Toxic symptoms appear quickly because of the mechanism of poisoning. The time until death after receiving a lethal dose is variable, but symptoms become apparent in seconds or minutes. Recovery from a sublethal dose is rapid.

Sodium cyanide inactivates the cellular activities and functions of all tissues of the body by "tying up" certain key cellular enzymes. As a chemical asphyxiate, it prevents the use of oxygen at the cellular level by inhibiting the activity of the tissue oxidative enzymes. Since the function of cellular respiration is necessary to life, any marked degree of interference with this process can produce serious illness or death. Because of this interference, oxygen cannot be absorbed from the arterial blood by the tissues. As a result, in cases of severe poisoning, venous blood retains the bright red color of arterial blood.

Following ingestion of sodium cyanide, systemic effects appear quickly. After a large dose, the person may become unconscious within a few seconds. The breathing is at first rapid but soon becomes slow and gasping. Convulsions may occur but in most cases of severe, untreated cyanide poisoning, coma and death occur within a few minutes without the occurrence of convulsions.

Weakness is a prominent symptom following a small, sublethal dose. This may be accompanied by dizziness, confusion, headache and vomiting. These symptoms are rapidly followed by coma and occasionally by convulsions. The heartbeat is weak and irregular. Breathing is initially rapid but soon becomes slow and shallow as the intoxication deepens. Milder forms of acute intoxication will result only in weakness, headache, dizziness, and nausea.

The characteristic picture in cyanide intoxication is the rapid onset of coma and cessation of breathing except for the mildest of exposures. If the patient does not die within an hour after ingestion of sodium cyanide, the person usually recovers quickly and completely.

A. First Aid for Cyanide Poisoning

Prompt treatment of cases involving sodium cyanide poisoning is of the utmost importance. If the patient has inhaled sodium cyanide dust, the person should be immediately removed to an area free from dust. If cyanide has contaminated the skin or clothing, the clothing should be immediately removed and contaminated skin area flushed with water until all traces of cyanide have been removed.

Someone should be sent immediately to call a physician or plans should be made for transport of the patient to a physician.

Maintenance of respiration is the most important initial first-aid measure. If breathing has stopped, an effective means of artificial respiration or resuscitation should be started as soon as it is certain that the patient has a clear airway. This is done by examining the mouth to see if the tongue has dropped back. If it has, it should be pulled forward. False teeth, loose bridges, chewing gum, tobacco, and other objects should be removed to prevent the patient from choking. Oxygen is

recommended and may be administered by anyone who is properly trained in this procedure. **DO NOT** give alcohol in any form.

Amyl nitrite is an antidote for cyanide poisoning . If the victim is breathing unassisted, amyl nitrite may be administered. Break an amyl-nitrite pearl by crushing it between your fingers and hold lightly under the nose for 15 seconds. Repeat five times at about 15-second intervals. Those giving first aid should be careful to keep the broken pearls away from their own mouth and nose, because they may inhale the amyl nitrite, become dizzy, and be rendered incompetent to give proper assistance to the poisoned patient. Amyl nitrite should not be used near any source of fire such as an open flame or a cigarette.

Should cyanide granules be taken internally, the patient should be removed to fresh air. If the person is conscious, the person should be made to vomit by orally administering warm salt water (one tablespoon of salt to each cup of water). This should be repeated until the vomit fluid is clear. The victim should be encouraged to initiate self-induced vomiting by putting their finger down the throat. If the victim continues to breathe unassisted, administer amyl-nitrite pearls as previously described.

If sodium cyanide has entered the eyes, they should be flushed immediately with large quantities of water for a minimum of 15 minutes. The eyelids should be held apart during the irrigation to ensure contact of water with all tissues of the surface of the eyes and lids. A physician, preferably an eye specialist, should be called into attendance. If a physician is not available, the eye irrigation should be continued for a second 15 minute period. No other eye-wash should be administered to the eyes unless directed by a physician.

SECTION V USE RESTRICTIONS

The U.S. Environmental Protection Agency (EPA) has placed 26 use restrictions on the use of the M-44 and sodium-cyanide capsules. These restrictions are part of the pesticide label and must be followed completely. Violations of state and federal laws may occur if label directions and use restrictions are not followed. State and federal laws provide for fines of up to \$5000 per

violation. If appropriate, violations of the U.S. Endangered Species Act can also be imposed, resulting in fines of \$50,000 and a year in jail. Misuse of the M-44 devices and sodium cyanide by a few individuals can also jeopardize the registration and use of the M-44 for all applicators.

The following numbered paragraphs provide the use restrictions for the use of sodium cyanide in conjunction with the rules for the M-44 ejector device set forth by the EPA on August 19, 1994.

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

Licensed pesticide applicators are subject to inspections by Utah Department of Agriculture and Food inspectors to ensure that appropriate laws and regulations are being followed

2. Applicators shall be subject to such other regulations and restrictions as may be prescribed from time-to-time by the EPA.

3. Each applicator of the M-44 device shall be trained in:

- a. safe handling of the capsules and device.
- b. proper use of the antidote kit.
- c. proper placement of the device.
- d. 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), Animal Damage Control (ADC) program, or any agency not working under an ADC cooperative agreement.

5. The M-44 device shall only be used to take wild canids:

- a. suspected of preying on livestock or poultry.
- b. suspected of preying on federally designated Threatened or Endangered Species.

c. vectors of a communicable disease.

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

It is legal to salvage the fur of wild canids taken by the M-44 coincidental to the device's use to protect livestock from depredation by wild canids.

7. The M-44 device shall only be used on or within 7 miles of a ranch unit or allotment where losses due to predation by wild canids are occurring or where losses can be reasonable 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:

a. in areas within national forests or other federal lands set aside for recreational use.

b. in areas where exposure to the public and family and pets is probable.

c. in prairie dog towns.

d. except for the protection of federally designated Threatened or Endangered Species, in National and State Parks; National or State Monuments; federally designated wilderness areas; and wildlife refuge areas.

9. The M-44 device shall not be used in areas where federally listed Threatened or Endangered 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 than 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-44's 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 only 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.

Do not place M-44 devices in growing crops. M-44 devices may be placed in fallow fields, harvested fields, or inactive, dormant crops such as hayfields in fall and winter.

14. The M-44 device shall be placed at least a 50-foot distance or at such a greater distance from any public road or pathway as may be necessary to remove it from the 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 one 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-44 devices shall be placed per draw station and no more than five draw stations shall be operated per square mile.

This restriction is intended to protect non-target animals that also may be attracted to the draw station. M-44 devices set back from the draw stations will less likely be encountered by bald eagles, ravens, and other scavengers.

17. Supervisors or 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.

The Utah Department of Agriculture and Food is authorized to inspect the records, equipment, and use practices of pesticide applicators.

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 non-functional 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 sit. Incineration may be used instead of burial for disposal. Place the capsules in an incinerator or refuse hole and burn until the capsules are completely consumed. Capsules may be incinerated using either wood or diesel fuel.

Select burial sites that are not subject to flooding or shallow ground water. Bury capsules as soon as possible. Do not collect a large number for burial later.

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 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/her 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 antidotal 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 dates 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 animals taken.
- f.** All accidents or injuries to humans or domestic animals.

Records must be maintained by the applicator for a minimum of two years. Records must be completed on a regular basis and are subject to inspection by the Utah Department of Agriculture and Food.

SECTION VI

M-44 PARTS AND THEIR USE

The M-44 device is comprised of four parts: the stake, the ejector, the capsule holder, and the sodium-cyanide capsule.

M-44 Stake

The M-44 stake is that component of the M-44 device that is driven into the soil and holds the rest of the M-44 components. The stake is a piece of electrical conduit about 6 inches long. The bottom of the stake is crimped closed. The top or open end of the stake has a stake ring which serves to lock the ejector in place. A drain hole is drilled near the base of the stake.

M-44 Ejector

The ejector is the component of the M-44 device that propels the sodium cyanide from the capsule. The plunger is powered by a 40-pound spring. The ejector is cocked using setting pliers that compress the spring. A trigger lever holds the compressed spring in place and releases the spring when the trigger is pulled. When the trigger is released the plunger passes through the capsule and propels the cyanide into the coyote's mouth. The trigger mechanism will wear with repeated use and become "hair-triggered" or fail to set at all. Defective ejectors should be discarded and replaced or repaired.

M-44 Capsule Holder

The capsule holder is used to house the M-44 capsule. All capsule holders should be checked for metal burrs that may prevent insertion of the cyanide capsule into the holder or prevent the cap on the capsule from being released. Capsule holders are purchased unwrapped. The holders must be wrapped with buckskin, cloth, wool, or other material to cover the exposed metal. Be sure these materials do not have an odor which may repel the target species. These materials should be securely fastened to the capsule holder and not be overly bulky. The wrap must not extend over the top. If it does, it may prevent proper release of the sodium cyanide or permit moisture to sit on top of the capsule.

M-44 Capsule

The M-44 capsule is made of translucent plastic. It contains 0.88 grams (.03 ounces) of sodium cyanide and 0.09 grams of inert ingredients including a marking

agent. The marking agent used in capsules available for private and commercial applicators in Utah is Yellow Day-Glo. Capsules used by the USDA Animal Damage Control personnel contain a blaze-orange marker. The marker is usually visible in or around the mouth of animals killed by an M-44. If it cannot be seen with the unaided eye, U-V light can be used to make the marker fluorescent and visible, even in daylight.

The capsule has a plastic cap which fits inside the wall of the capsule and is recessed from the top of the capsule 1/16 inch when in place. At the bottom of the capsule is a thin, stiff paper disc or wad that pushes the cyanide out of the capsule when the ejector plunges through it. The top and bottom of the capsule are sealed with a petroleum hydrocarbon wax. The wax seal at the top of the capsule is slightly domed so that moisture does not collect on top of the capsule.

A small label is wrapped around the capsule. Do not remove this label. The inside diameter of the capsule holder is sized to permit the capsule to fit into it with the label on. The capsule will be loose inside the holder and may fall out if the label is removed. If a capsule does not fit into the capsule holder with the label on, the inside of the capsule holder will need to be drilled out slightly.

A. Selecting the Site

Once the pasture or general area where M-44 devices will be set is decided on, survey the area for gates and other access points. Place warning signs at these places before setting any devices.

M-44 devices do not automatically take coyotes and foxes. Care must be taken in the selection of M-44 placement locations in order to achieve good results. Placement of the M-44 in areas where coyotes and foxes are traveling and foraging for food is of primary importance. There is no reason to place M-44 devices in areas where these animals are not present. Fresh tracks are the best sign, however, droppings, recent livestock kills, and dens provide good indications that the areas are frequented by these predators.

Coyotes tend to travel along routes that are easy and convenient to them such as game and livestock trails and roadways. M-44 devices set along pathways should be

set one or two feet off the path on the side of the trail from which the prevailing wind comes. This will tend to carry the scent of the bait placed on the device to the coyote as it travels along the path. When possible, set the device in the open, on level ground, and with a level approach for the coyote.

Past studies have shown that M-44 devices are highly effective when placed along travel trails and near kill sites. Other sites that have proven successful include bone piles, stock watering areas, den sites, and near draw stations. Sites along a fence-line that permit easy passage for coyotes can be good locations for an M-44 set. Applicators should check often for fresh sign, particularly tracks, and especially after periods of snow and rain to determine coyote and fox travel patterns and adjust their set sites accordingly.

Knowledge about coyote behavior and habits is the most important factor in the successful use of the M-44. Individuals that are successful trappers are invariably very knowledgeable about coyote biology and behavior. The same skills and knowledge used to successfully trap coyotes should be employed in the successful use of M-44 devices. Random selection of placement sites and careless setting techniques result in failure of the M-44 device.

B. Setting the M-44

Always keep safety in mind. Remember that there are few chemicals you are likely to handle that are more toxic than sodium cyanide. Applicators generally work alone when setting M-44 devices. Exposure to sodium cyanide can cause helplessness before a person is able to administer self-treatment measures. Applicators should stay upwind of the device, keep the mouth closed, use gloves, keep hands cupped over the capsule when setting the device, and keep the antidote kit on their person.

In most situations, a pilot hole slightly shorter than the length of the M-44 stake should be made in the ground where the device will be set. Do not hammer directly on the top of the M-44 stake when placing it in the ground because that will likely damage the locking ring. Use a driving tool consisting of a bolt or rod placed inside the stake. Drive the stake into the ground by hammering on the driving tool. The bottom of the stake may be damaged, unless soil or a wooden dowel is placed in the

bottom of the stake to cushion the hammer blows. The soil or dowel should not be allowed to plug the drain hole.

When the stake is properly set, the top of the stake will be level with the soil surface. Open the locking ring. It is best to set the stake so the lock-ring slot is facing you.

Remove an M-44 stake from the ground by placing the driving tool inside the stake and rocking the driving tool back and forth until the stake is loose enough to pull free. Pliers gripped below the locking ring may be necessary to twist the stake free. If the ground has frozen since the stake was placed, it may be impossible to remove. Extra stakes may be needed to make other sets until the frozen-in stake can be removed without damage.

Place a sodium cyanide capsule into a capsule holder and set it aside. The capsule should be flush with the top of the capsule holder. Use an end of the ejector-setting pliers to push the capsule into the capsule holder, if necessary. You may find it more efficient and convenient to load the capsule holders before going to the field.

Cock an M-44 ejector unit, using the ejector-setting pliers. Press the plunger all the way down. While holding the plunger down, lift the trigger arm upward to set the trigger. With the ejector unit still in the pliers, pull the trigger down slightly for a lighter pull to release the ejector. Move the trigger back and forth and test it until a crisp trigger release is felt.

Use Caution! The trigger should not be adjusted to such a light tension that the device could accidentally discharge during placement.

To test the ejector or when uncocking the ejector, release it in the setting pliers to absorb the shock. This will reduce trigger wear and increase the working life of the ejector. Ejectors that have become "hair-triggered" should be repaired or retired from service.

Hold the cocked ejector in one hand with the trigger arm pointed up and your thumb placed lightly against its underside. In your other hand, hold the loaded capsule holder with your thumb and first two fingers, with the

top of the capsule holder pointed into the palm of your hand. Screw the capsule holder onto the cocked ejector unit. *Do not screw the ejector into the capsule holder!* Screw the capsule holder on until it is snug but not overly tight. Continue to hold the loaded ejector unit by the capsule holder with your hand cupped over the top of the cyanide capsule. This process should be done at arm's length, away from your face. Never point the loaded ejector unit at yourself or another person. Always keep a cupped hand over the top of the cyanide capsule.

Increased safety from an accidental discharge can be obtained by placing a small pill vial or plastic bag over the top of the capsule holder when loading or unloading an ejector unit.

Squat at arm's length from the M-44 stake with your body and face turned at an angle away from the stake. Set the loaded ejector unit into the stake and close the lock ring.

Another method of loading the stake is to place the cocked ejector into the stake, close the lock ring, and then screw the loaded capsule on the ejector. Keep your hand cupped over the top of the capsule holder and screw it onto the ejector while squatting at arm's length from the M-44 stake.

Apply the bait or scent to the side of the capsule holder. Do not apply the bait on top of the capsule or capsule holder. This might cause the cap to stick or the seal to deteriorate. *When working at a loaded set, never stand over or bend over the device.*

Once the set is complete, place a staked warning sign within 25 feet of the device. Applicators should place the staked warning sign at the same distance and direction from the device at each set. A consistent placement practice will allow the applicator to more easily relocate each set.

C. Good Use Practices

1. Maintain equipment that is clean and in good working condition.

2. Store M-44 stakes, ejectors, and capsule holders in separate bags or containers. Do not place used or soiled components with clean equipment.

3. Make a clean set and avoid disturbing the surroundings. Foreign odors or litter may shy coyotes away from a set.

4. A ground cloth may be used while placing M-44 devices. A clean canvas is recommended. Avoid using materials which may have odors offensive to the target species.

5. Keep one pair of gloves for use when setting the M-44. Gloves used for other ranch jobs should not be used as they may pick up foreign odors and repel the target species.

6. Make sure your field boots or rubber overshoes are not carrying foreign odors. Applicators who work around shops where grease and oil are present may pick up these odors and transport them into sagebrush and grass while walking to and from M-44 sets.

7. Avoid spitting, discarding cigarette butts, or loitering around the M-44 set location.

8. In livestock pastures, use a trench set and cover the M-44 device with a cow chip. This will reduce pawing and licking of M-44 devices by livestock.

9. Sex scents may be placed 15 to 30 feet from M-44 sets. These scents may draw the target species within areas where the M-44 devices are placed. These will be most effective during the coyotes' breeding season.

10. Discontinue or move an M-44 device to a new location if it has not been visited by a target species within 30 days.

11. Check around the location of a discharged M-44 set and look for the capsule cap. If the cap is found next to the device, it often indicates that the coyote took a direct hit and that the carcass will likely be found close by. Also, look for teeth marks in the capsule holder.

12. The end of the setting pliers or a dowel can be used to remove capsules from the capsule holder. Avoid

using sharp objects which might gouge the inside of the capsule holder.

13. Remove all broken or non-working M-44 devices from use.

14. Dispose of all used or caked cyanide capsules by burial or incineration.

15. Domestic dogs can be trained to avoid M-44 devices by using dog-training capsules loaded with red pepper. These training capsules are available from the USDA Animal Damage Control program.

16. Keep the antidote kit in your pocket when handling the sodium cyanide capsules.

17. Keep a container of water in your vehicle to wash and/or decontaminate skin or eyes contaminated with sodium cyanide. Carry a canteen of water with you when you are servicing M-44 devices away from your vehicle.

18. A thorough knowledge in the use of the M-44 device cannot be acquired by reading a manual or attending a training session. Working with other people experienced in trapping and the use of M-44's is an important part of training for effective use of the M-44 device.

D. Equipment Care and Maintenance

M-44 Capsules

A capsule should not be used unless the cyanide load is loose and the cap is intact. The translucent plastic capsule allows for visual checks of the cyanide. The cyanide granules should "flow" like salt inside the capsule when the capsule is tipped from end to end. When a capsule is shaken next to your ear, it should sound loose. If there is a doubt, *carefully* open a small sample of the capsules. The contents should pour out freely. Any sticking or clumping means the cyanide has caked. Other capsules can be expected to be in similar condition. Dispose of the capsules if there is evidence of caking. Coyotes that pull devices with caked capsules are unlikely to be killed and will become "wise" to the device.

Capsule longevity is highly variable. The more moisture and temperature variation they are exposed to, the sooner they can be expected to cake. During heavy periods of rain, a capsule may last no more than two weeks. Under dry conditions, capsules may last two months. Keep the field conditions in mind when you have M-44 devices set out and check the sets as often as needed to be sure they will be effective.

Boxes of M-44 capsules are marked with the date of manufacture. Try to use capsules within six months of the manufacture date. Purchase capsules in a quantity that you expect to use in three to six months. Do not expose the capsules to excessive heat; for example, capsules should not be left on the dash of a vehicle.

Store all capsules in a dry environment where there is a minimum of moisture and temperature variation. This adds to the effective life of the capsule. Silica gel or other desiccants can be stored with capsules to retard caking. Remember to always keep the capsules under lock and key until used.

M-44 Ejectors

M-44 ejectors need to be clean and lubricated to work well. The trigger and plunger should be lubricated before use. There are many good lubricants available. Several have been recommended by experienced M-44 users. These include silicon spray lubricants (food grade without solvents), mineral oil, Triflow[®] silicone spray and light greases such as Lubriplate No. 105 or FML-O (a food-machinery lubricant). Glycerine is not recommended because it will crystallize in cold weather.

The sodium cyanide is the major cause of corrosion to the ejector. Cyanide should be cleaned from the ejector as soon as possible. Clean it with a wire brush and relubricate it before reuse.

Ejectors made after 1992 use a retaining pin rather than a washer and a crimped bottom to hold the ejector spring in place. The spring can be removed for cleaning by removing the retaining pin. Do this by compressing the spring from the bottom of the ejector with a small screwdriver and removing the pin with a pair of needle-nosed pliers.

M-44 ejectors in the field should be lubricated and reset at least once a month if they have not been pulled. Pulled units should be serviced as soon as possible.

The most recent improvement in the ejector design resulted in a fairly strong pull to discharge the unit. The amount of trigger pull can be reduced in several ways:

1. Cock the ejector by setting the trigger arm to a point less than the maximum. This reduces the pull necessary for firing.
2. Lubricate the ejector.
3. Dry-fire a new ejector six times against a block of wood. This reduces the pull by one or two pounds.
4. When closing the lock ring over the ejector, position the lock-ring loop over the trigger arm. This reduces the pull by about one pound. This method, however, may result in pullouts where the ejector is pulled free of the stake. This may happen after a device has been pulled by one animal and another animal pulls on the fired device. The trigger arm may slip through the loop and permit the capsule holder and ejector to be carried off. Pullouts can be reduced by reshaping the trigger arm. As manufactured, the terminal end of the trigger arm is parallel to the ground when the ejector is set. Reshape the end of the trigger by bending it upward to a vertical position, forming it into a hook-like appearance.

Appendix B provides additional M-44 Device User Tips.

SECTION VII COYOTE ATTRACTANTS

The effective use of M-44 devices requires the use of attractants commonly called lures or baits by trappers and M-44 users. Baits that induce biting and chewing should be placed on the device. Lures such as sex scents may be used to attract coyotes to an area but should not be placed on the device. They are more likely to cause the coyote to urinate or roll on the device rather than pull at it. Place them away from the device. Food scents placed on the device should be used sparingly since high doses may act as a deterrent. Attractants should be reapplied every two to four weeks,

or more often after rain. Ready-made attractants are commonly available from commercial sources or can be homemade.

SECTION VIII BIOLOGY OF THE COYOTE AND RED FOX

Basic Description

The coyote and red fox are members of the canine family. Coyotes are primarily gray-colored, with variations from nearly white to reddish-brown to nearly black; the underbelly is a lighter color. Red fox are normally a reddish yellow, darkest on the back with the belly light-colored. There are many color variations of the red fox such as the cross (dark area over the shoulder and down the front) and silver (black with white-tipped body hairs and white tip on the tail). Color variations for both species seem somewhat related to the type of habitat in which they live.

Body weight varies with areas and food supply, but most adult coyotes weigh from 20 to 35 pounds, while foxes average 10 to 20 pounds. Males of both species are slightly larger than the females.

Their physical abilities include good eyesight and hearing and an exceptionally keen sense of smell. Although not as fast as greyhounds, they have been measured at speeds of up to 40 miles an hour and can sustain slower speeds for several miles.

Distemper and mange are the most common coyote and fox diseases. Rabies and tularemia also occur and may be transmitted to other animals and humans. Some parasites of coyotes and foxes include mites, ticks, fleas, worms, and flukes. Mortality is highest during the first year of life and few coyotes or fox live more than 10 to 12 years in the wild.

Behavior

Coyotes and red foxes are found in nearly all types of terrain. Timber, brush, open prairie and desert areas are favored habitat types, but both species are highly adaptable and are also found in farming areas and near cities.

Coyotes and red foxes are most active at night and during early morning hours, especially where human activity occurs, and during the hot summer months. For those areas that have minimal human interference and during cold weather, these species are active throughout the day. They will bed in sheltered areas but do not use dens except when raising young. They may seek temporary shelter underground in severe weather or when closely pursued.

Dens are found in steep banks, rock crevices, sinkholes, and underbrush as well as in open areas, but they usually are found in areas which provide protective concealment. Dens are often holes that have been used by badgers, skunks or other animals, with entrances enlarged to about one foot in diameter. Dens vary in depth from 4 or 5 feet up to 50 feet and may have several openings.

The coyote and red fox usually breed in February and March and produce litters about eight to nine weeks later, in April and May. Females sometimes breed during the winter following their birth, at less than one year of age, especially if the food supply is plentiful. The average litter size is five to seven pups. Coyotes may crossbreed with dogs to produce the coy-dog hybrid. These hybrids are fertile, although their breeding seasons don't usually correspond with those of coyotes.

Both parents hunt and bring food, usually regurgitating food for the pups until the pups are several weeks old. Pups begin coming out of the den by three weeks of age and within two months they follow adults on short hunting trips. Pups are normally weaned by six weeks of age and are often moved to larger living quarters.

Extensive travel is common in hunting, although both species hunt the same areas regularly if plenty of food is available. They occasionally bury food remains for later use. The family usually remains together until late summer or fall, when pups become independent, although occasionally they are found as groups until breeding season begins.

Food Habits

Analyses of stomach contents of 8,263 coyotes from several western states indicated that about 50 percent of the diet consisted of rodents and rabbits, with another 25

percent composed of carrion. As a carnivore, 98 percent of the average coyote diet is animal matter with two percent vegetable matter. Diet for the red fox consists mainly of available animals ranging in size from insects to rabbits, with mice making up the largest percentage of their diet throughout the year. Berries and other fruits are also consumed, when available.

Coyotes and red foxes normally kill smaller mammals by biting the head or neck. On older lambs and adult sheep, kills are usually made by biting the throat just back of the jaw and ear. Small calves may be killed in a similar fashion, primarily by coyotes. The major cause of death is generally due to damage to the trachea and/or to nerves affecting respiration, blood pressure, and heart rate, rather than the loss of blood.

Coyote and red fox kills usually have clean puncture wounds in the head or throat, although coyotes, especially inexperienced pups, occasionally attack the flank or hindquarters. Dogs usually kill by attacking the hindquarters, flanks and head and rarely kill as cleanly as coyotes and foxes. Badly torn and slashed animals with damage to the head, ears and sides are typical of dog predation. Red foxes kill and feed on small lambs much the same as coyotes do, but larger sheep often show many teeth marks in the throat. Occasionally, fox will pull wool loose from flanks and hindquarters or damage the head, as dogs often do. Skinning the hide away from the wound with a sharp knife and exposing the flesh is a reliable way to properly identify the extent of damage caused and the probable predator.

SECTION IX ACKNOWLEDGMENTS

This training manual was provided by Daniel Sullivan of the Montana Department of Agriculture and represents a revision of the manual produced by the former Vertebrate Pest Control Bureau, Montana Department of Livestock, in 1976. Mr. Sullivan's revisions were reviewed by Jim Hoover, Dave Hayes and Dave Nelson, of USDA-APHIS-ADC in Montana, and Monty Sullins, Montana Department of Agriculture. UDAF appreciates and acknowledges the efforts of these individuals and the willingness of the Montana Department of Agriculture to share this information.

SECTION X APPENDICES

APPENDIX A

MATERIAL SAFETY DATA SHEET M-44 CYANIDE CAPSULES

EPA Registration Number 56228-15
10-95

SECTION I. MATERIAL IDENTIFICATION

DESCRIPTION: Sodium cyanide granules within a plastic capsule. Trade Name: M-44 Cyanide Capsules

MANUFACTURER: United States Department of Agriculture
Animal and Plant Health Inspection Service
Animal Damage Control
Hyattsville MD 20782
(301) 436-7175

SECTION II. INGREDIENTS AND HAZARDS

Sodium Cyanide: 91.06%
Inert Ingredients: 8.94%
Human Oral LD₅₀: 2.8 mg/kg
Rat Oral LD₅₀: 6.9 mg/kg

SECTION III. PHYSICAL DATA

Appearance: Orange granules
Boiling Point: 1496°C
Vapor Pressure (mmHg): 1 at 817°C
Vapor Density: n/a
Solubility: 34% in water at 15°C
Melting Point: 560°C
Molecular Weight: 49.01
Odor: Slight bitter almond odor

SECTION IV. FIRE AND EXPLOSION DATA

Flash Point: none
Autoignition Temp.: none
Flammability Limits: none

Extinguishing media - water spray. Cool fire-exposed metal container with lots of water. DO NOT USE CO₂ extinguishers. Contact of NaCN with acid will produce highly toxic, flammable HCN. Firefighters must wear full

protective clothing, eye protection, and self-contained breathing apparatus. If body contact occurs with NaCN or its solutions, flush with water immediately; remove contaminated clothing.

SECTION V. REACTIVE DATA

Stability good if kept dry. Avoid moist conditions during storage. Does not polymerize. Reacts violently with oxidizing agents. When moist, can produce HCN gas, which is highly toxic.

SECTION IV. HEALTH HAZARD DATA

EMERGENCY CONTACT NUMBER: 1-800-535-5053

EXPOSURE LIMIT: Permissible Exposure Limit for CN is 5 mg/m³ in air or as CN on skin. Ceiling level of 4 mg/m³ for 10 minutes of CN and HCN. Cyanide is fast-acting and highly poisonous by ingestion (<25 mg, human lethal dose). It can enter the body through the skin (especially through open wounds) or by inhalation of dust, solution mist, or HCN. Cyanide prevents cells of the body from using oxygen.

EFFECTS OF OVEREXPOSURES: Overexposure causes headache, dizziness, weakness, profuse ineffective breathing, and nausea, which can be followed by weak and irregular heartbeat, unconsciousness, convulsions, coma and death. NaCN is alkaline and thus irritating and corrosive to body tissue it contacts. Repeated minor contact causes "cyanide rash."

FIRST AID: In all cases, call a physician immediately. Get medical help promptly after administering first aid. Administer the antidote, AMYL NITRITE, per directions.

IF INHALED: Remove to fresh air. If not breathing, give artificial respiration. **DO NOT GIVE MOUTH-TO-MOUTH RESUSCITATION.** If breathing is difficult, give oxygen. Keep patient warm and at rest.

IF SWALLOWED AND IF PATIENT IS CONSCIOUS: Give water to rinse mouth, then induce vomiting by tickling back of throat with the handle of a spoon or by giving a glass of warm, soapy water. Repeat several times.

IN CASE OF CONTACT: immediately flush skin or eyes with plenty of water for at least 15 minutes.

SECTION VII. SPILL, LEAK, AND DISPOSAL PROCEDURES

M-44 capsules are sealed during manufacture. Leaks are unlikely. Ventilate area and allow only qualified personnel to handle spill. Clean-up personnel may require protective clothing and respiratory protection from dust. Collect material and place in a closed container for recovery or disposal. Do not flush to sewer!

SECTION VIII. SPECIAL PROTECTION INFORMATION

Use good housekeeping practices where M-44s are manufactured or stored. Wear gloves when setting the M-44 device and use precautions discussed during training.

SECTION IX. SPECIAL PRECAUTIONS AND COMMENTS

Store in cool, dry, well-ventilated area away from acids and oxidizing agents. Protect M-44 capsules from physical damage. Use good personal hygiene practice and keep product away from food and beverages.

APPENDIX B

M-44 DEVICE USER TIPS¹

THIS TECHNICAL NOTE DESCRIBES M-44 EQUIPMENT PROVIDED BY THE USDA APHIS/ADC POCATELLO SUPPLY DEPOT, POCATELLO, IDAHO. THE INFORMATION MAY OR MAY NOT APPLY TO EQUIPMENT FROM OTHER SOURCES.

1. KNOW YOUR EQUIPMENT

The current M-44 ejector, designed by Pocatello Supply Depot (PSD) manager Paul Edstrom in 1984, was introduced in January 1985. No other M-44 ejector has been made at the PSD since that date. The Edstrom ejector has a 3 1/3-inch long body with no bottleneck. Capsule holders are stamped "U.S. GOVT." Edstrom ejectors are intended for use with the swaged-top stake which is 6 inches long with outside diameter of 0.75 inches. This is the only M-44 stake available from PSD.

The standard ADC-program M-44 ejector from the late 1960s through 1984 was called the "Poteet model." It has a 3-inch long body with bottleneck. Capsule holders are stamped "U.S." Poteet ejectors and capsule holders are no longer available from PSD, but much of this equipment is still in use. Poteet ejectors were designed for use with Leyerly-top stakes, which have a cast top riveted to the 0.70-inch O.D. stake tube. Most Leyerly stakes are five or seven inches long. They are no longer manufactured.

M-50 ejectors, introduced in 1979, have 4-inch long bodies without bottleneck. Capsule holders are stamped "U.S." These ejectors used a 0.50-caliber cyanide capsule. Manufacture of M-50 ejectors, capsule holders, and capsules was discontinued in 1983.

2. M-44 CYANIDE CAPSULES

M-44 capsules contain a mixture of sodium cyanide and inert ingredients. The amount of sodium cyanide mixture

in each capsule is approximately 0.97 grams (0.03 ounces). This includes 0.88 grams of sodium cyanide (active ingredient) and 0.09 grams of inert ingredients. One of the inert ingredients is a marking agent that can be detected in or around the mouths of animals killed by M-44 devices. Capsules used by ADC personnel contain Day-Glo blaze-orange fluorescent particles. Capsules made by PSD for use outside the ADC program contain a yellow Day-Glo marker.

Day-Glo particles usually are easy to see in or around the mouths of animals killed by M-44s. If it is important to know whether or not a particular animal was killed by an M-44, but since marker particles aren't visible to the unaided eye, a short-wave UV light (366 nm) should be used to search for them. With the animal specimen in a dark place, Day-Glo particles will fluoresce under UV light even if they aren't visible in daylight.

Capsule Storage

Waxed capsules are very susceptible to heat damage. Keep them at room temperature (70-75 °F) in a dry place as much as possible. Avoid wide temperature fluctuations because capsules subject to repeated heating and cooling deteriorate faster than capsules kept at a constant temperature.

If capsules deteriorate under the storage conditions you normally use, try storing them with a desiccant such as silica gel in a water-tight jar (one- or two-quart, wide mouth canning jar with good, tight lid) or a small metal, military-type ammo can with a snap-down lid. One good desiccant is Indicating Drierite, which changes color as it absorbs moisture. By looking at the color, you can tell when the Drierite is waterlogged. You can then dry it out in your kitchen oven. When dry, it will return to the original color and is then ready for reuse.

¹For further information contact:

Wildlife Research Center
1201 Oakridge Dr.
Ft. Collins, CO 80525
(970) 223-1588

Sherm Blom
Pocatello Supply Depot
238 E Dillon St.
Pocatello ID 83201
(208) 236-6920

Sealants

M-44 cyanide capsules were sealed with beeswax from August 1983 to April 1989 at which time a better sealant, Scheel SC-100 Petroleum Hydrocarbon Wax was adopted. All capsules made since April 1989 have the new sealant. Beeswax-sealed capsules should no longer be used.

Carrying Capsules for Use in the Field

Do not carry large numbers of M-44 cyanide capsules in your vehicle. Take only enough each day for the number of M-44 devices you plan to set or check that day. Keep capsules in your vehicle out of sunlight and away from heat. Do not carry capsules in the glove box or in tool boxes where extreme temperatures may occur.

Checking Capsules

When you purchase new capsules, or start to use capsules that have been in storage, inspect them for the following:

Caking: Tip a few capsules back and forth, or listen while shaking them, to see if contents are free-flowing. If there is any doubt, open a few CAREFULLY and pour contents out. Contents should drop out freely. Any sticking or clumping means the cyanide has started to cake. These capsules should not be used.

Overfill: As filled at PSD, capsules have about 1/10" air space below the top wad. Cyanide expands when it absorbs water. When capsules appear to be too full, moisture has leaked through the seal. This may have happened even if the seal looks intact. Overfilled capsules often will be partly caked - check for caking as explained above.

Age: Check the date of manufacture as marked on each box of capsules. A date stamp that reads "08 92" means that the capsules were made in August 1992. Be alert when you change from one lot of capsules to another, and inspect each new lot for caking as described above. Try to use capsules within six months from date of manufacture. The older the capsules, the more likely they are to be caked or otherwise defective.

Undersized Capsule Holders: Capsule holders shipped from PSD before July 1990 may have undersized bores. If capsules don't easily fit in your capsule holders, enlarge the bores by running a 15/32" drill through each

one. Capsule holders marketed since July 1990 have 0.005" larger inside diameter and do not need to be drilled out.

Capsule Labels: Capsules should fit in the capsule holders without removing the labels. If your capsules don't fit well, drill out the capsule holders as described above. Do not remove capsule labels. ADC-program capsules now have vinyl rather than paper labels. The vinyl labels will not absorb moisture and swell, as paper labels did.

Flare: Flare, or swelling of capsule mouths, is caused by a chemical reaction between wax ingredients and plastic. The reaction is accelerated by heat. Check for flare by inserting capsules in a capsule holder. If they don't slide in easily, they are flared. Don't force them in as this will ruin the seal. Purchase new capsules as soon as possible.

3. EJECTORS

Lubrication and Cleaning

M-44 ejectors need to be clean and properly lubricated to work well. Grease or oil the trigger and plunger whenever you set an M-44 device. There are many good lubricants. The following have been recommended by experienced users of M-44 devices: silicone spray lubricant, mineral oil, Triflow, Vaseline, petroleum jelly, and light grease such as Lubriplate No. 105 or FML-O (food-machinery lubricant). Glycerine is not recommended. Use whatever works for you, but ejectors need to be lubricated.

Cyanide is the primary cause of corrosion that produces ejector malfunctions. Once an ejector is fired and gets cyanide in it, the ejector should be cleaned carefully with a wire brush and lubricated before it is reset.

Ejectors made since July 1992 use a retaining pin rather than a metal washer and crimp to hold the ejector spring in place. The retaining pin can be removed to take these ejectors apart for cleaning. Compress the spring from the bottom end of the ejector with a small screwdriver, then remove the pin with a pair of needle-nose pliers.

Frequency of Servicing

Those M-44 devices that have been set should be lubricated and reset at least once each month if they have not yet been pulled. When servicing undisturbed units,

CAREFULLY test-pull some of them to confirm proper functioning.

Bottom Blowouts

Failure of the bottom crimp has been a problem with certain lots of M-44 ejectors, particularly those made from January to June 1985. (These are the only current model ejectors that lack the internal, O-ring shock absorber on the plunger.) If you have had this problem, inspect similar ejectors for evidence of crystallization. Crystallized metal will have a grainy appearance and the bottom crimp may show cracks. These ejectors should not be used.

In July 1992, the M-44 ejector was modified to eliminate the bottom crimp. Ejectors made since that date use a retaining pin rather than a bottom crimp to hold the ejector spring in place. This modification is expected to prevent bottom blowouts.

Trigger-Pull Force

The current M-44 ejector requires a stronger pull to discharge than did the pre-1985 Poteet ejector. The harder pull results from a new, stronger spring. Several things can be done to reduce the trigger pull:

1. When cocking the ejector, do not push the trigger as far up as it will go. Instead, set it at a right angle to the body center line, or set it by "feel" to avoid excessive sear engagement.
2. Lubricate the trigger and plunger.
3. Before using new ejectors, cock and snap (fire) each one six times. This will reduce pull force by one to two pounds (new model ejectors). When snapping ejectors, hold them against a block of wood or other solid object to avoid internal damage.
4. When closing the lock ring (after ejector is in the stake), position the lock-ring loop over the trigger. With new model ejectors and stakes, this reduces the pull force by about one pound.

Ejector Pullouts

When lock-ring loops are positioned over the ejector trigger, as described above, ejectors may be pulled out and carried off. Most pullouts occur when a discharged M-44 device is visited by another animal that frequently

pulls out the ejector and carries it off. Pullouts can be reduced by reshaping the trigger.

As purchased, the outermost trigger segment (3/8" long) on the M-44 ejector is parallel to the ground when the ejector is set. To reshape a trigger, clamp the ejector in a vise and bend the trigger end up to a vertical position.

4. STAKES

Trigger Notch

For some M-44 stakes made since 1985, the trigger notch is too shallow. This creates a hazard because the ejector can fire when the operator attempts to close the lock ring, which will not close due to insufficient clearance over the trigger. To remove this hazard, inspect the notch on all swaged-top stakes and use a chain saw file to deepen any notches that are too shallow.

Driving Stakes

Never hammer directly on M-44 stakes, as that will break or deform the tops. Instead, use a driving rod inside the stake. In hard ground, make a pilot hole first. Before driving, put gravel or a wood block in the stake to protect the bottom from damage. For current model, swaged-top stakes, good wood blocks can be made from 5/8" hardwood dowel. Saw it into 7/8" lengths.

Another good way to avoid stake damage is to use a driving tool. Put a rubber bumper, such as an automotive shock absorber bushing, on a bolt of whatever length and diameter is appropriate for your stakes.

Keeping Dirt and Sand Out

A "dirt skirt" can be used to keep sand or soil from getting into the stake and interfering with ejector movement. The dirt skirt is a round, 2-3" hole in the center. To use, place cocked ejector in stake. Set the lock ring, then place the skirt on the ejector before you screw the capsule holder on. Cover the skirt with soil.

5. SAFETY

Make Safety a Habit

When setting M-44s devices, never put yourself in a position where cyanide will hit your face or eyes if the unit discharges accidentally. Work on the upwind side and do not stand or kneel over the ejector.

A small pill vial, plastic bag, or thumb from a leather glove, when placed over the capsule holder, is a good safety precaution to confine ejected cyanide if the unit accidentally discharges while you are working on it.

Antidote Kits

Check expiration date to be sure your antidote kit is current. Keep it on your person at all times while setting or servicing cyanide ejectors.

WEIGHTS AND MEASURES

Weights:

1 ounce	= 28.35 grams
16 ounces	= 1 pound
	= 453.59 grams
1 gallon water	= 8.34 pounds
	= 3.785 liters
	= 3.78 kilograms

Liquid Measures:

1 fluid ounce	= 2 tablespoons
	= 29.573 milliliters
16 fluid ounces	= 1 pint
	= 0.473 liters
2 pints	= 1 quart
	= 0.946 liters
8 pints	= 4 quarts
	= 1 gallon
	= 3.785 liters

Length:

1 foot	= 30.48 centimeters
3 feet	= 1 yard
	= 0.9144 meters
16 ½ feet	= 1 rod
	= 5.029 meters
5,280 feet	= 320 rods
	= 1 mile
	= 1.6 kilometers

Area:

1 square foot	= 929.03 square centimeters
9 square feet	= 1 square yard
	= 0.836 square meters
43,560 square feet	= 160 square rods
	= 1 acre
	= 0.405 hectares

Speed:

1.466 feet per second	= 88 feet per minute
	= 1 mph
	= 1.6 kilometers per hour (kph)

Volume:

27 cubic feet	= 1 cubic yard
	= 0.765 cubic meters
1 cubic foot	= 7.5 gallons
	= 28.317 cubic decimeters