M-44 Use by Non-USDA-Wildlife Services Applicators between 2006-2019 in Montana

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ABSTRACT: Use of M-44 sodium cyanide devices has been opposed by various groups contending that M-44s threaten human health and safety and endanger non-target animals. In Montana, M-44 sodium cyanide devices may be used by non-USDA-Wildlife Services individuals licensed by the Montana Department of Agriculture. This paper summarizes the use data submitted by these non-federal applicators between 2006-2019. The data includes use records, take (both target and non-target), and livestock loss reports. It is hoped that this information provides additional data and context to inform the debate over this controversial predator management tool.

KEY WORDS: *Canis familiaris, Canis latrans*, coyote, cyanide bombs, depredation, dog, M-44, Montana, predacide, predator control, sodium cyanide

Proceedings, 29th Vertebrate Pest Conference (D. M. Woods, Ed.)
Paper No. 47. Published November 30, 2020. 5 pp.

INTRODUCTION

M-44 sodium cyanide capsules are registered by the Environmental Protection Agency for the control of coyotes (*Canis latrans*), red fox (*Vulpes vulpes*), gray fox (*Urocyon cinereoargenteus*), and wild dogs (*C. lupus familiaris*) that are threatening livestock and federally designated endangered or threatened species, or vectoring communicable diseases (EPA Reg. No. 35975-2, March 22, 2018). The capsules, manufactured by USDA-APHIS-Wildlife Services Pocatello Supply Depot (EPA Est. # 56228-ID-1) in Pocatello, Idaho, have a cylindrical shape and are made of plastic. Each capsule contains 0.97 grams of material containing by weight 91.06% active ingredient namely powdered sodium cyanide (CAS# 143-33-9). The remaining 8.94% material by weight consists of a drying agent, to prevent the active ingredient from caking, along with a coloring dye. Since USDA-Wildlife Services has their own registration for sodium cyanide capsules (EPA Reg. No. 56228-15), the coloring dye distinguishes capsules used by USDA-Wildlife Services personnel (blaze orange), from those used by non-USDA-Wildlife Services personnel (yellow). In all other regards, the sodium cyanide containing capsules are identical. The capsules are placed in M-44 ejectors which when pulled, as when a canine bites and tugs, cause a spring-loaded plunger to strike the capsule thereby sending the toxic powder upward into the animal's mouth. For a detailed description of the M-44 device and how it is used see Blom and Connolly (2003).

RESULTS

Montana Private M-44 Program

Following the presidential embargo on M-44s in 1972 on federal lands (Executive Order #11643), the Environmental Protection Agency (EPA) issued Pesticide Regulation Notice 72-2 which suspended the registration of sodium cyanide. In 1974, the EPA granted the Montana Department of Livestock an experimental use permit for M-44s. Montana trained and licensed 278 applicators, working in 22 counties plus the Fort Peck Indian Reservation, to use M-44s. Between July 1, 1974 and June 30, 1975, these applicators reported the taking of 608 coyotes, 148 foxes, 23 skunks (*Mephitis mephitis*), six raccoons (*Procyon lotor*), four dogs, and one badger (*Taxidea taxus*) (Montana DOA 2018). Over an additional three months, Matheny (1976) recorded the Montana M-44 take to have risen to 670 coyotes, 156 fox, four dogs, 36 non-targets.

Today, Montana is one of five states that licenses non-USDA-Wildlife Services to use sodium cyanide capsules in M-44 devices (Table 1). While the M-44 program was originally managed by the Montana Department of Livestock, the program was transferred to the Montana Department of Agriculture (DOA) in 2012 (Robbins 2012).

Table 1. States where M-44s are legal, January 1, 2020.

States Allowing* M-44 Use 2020**	USDA-WS	Private
Colorado	X	
Idaho	X	
Montana	X	X
Nebraska	X	
Nevada	X	
New Mexico	X	X
North Dakota	X	
Oklahoma	X	
South Dakota		X
Texas	X	X
Utah	X	
Virginia	X	
West Virginia	X	
Wyoming	X	X
Total: 14	**Total: 13**	**Total: 5**

*sodium cyanide is registered in Arizona, but the US Secretary of Agriculture has prohibited WS from using the product in that state. ** Oregon banned the use of M-44s effective January 1, 2020 (pers. commun., Oregon USDA-WS).

The Montana DOA employs a Vertebrate Pest Specialist to oversee Montana's M-44 Private Applicator Program. Management of the program includes obtaining use reports, updating training materials, providing signs (gate and elevated), verifying that products are only sold to

licensed applicators, and notifying applicators of label changes and use requirements. Since 2015, the label has changed twice, once with minor changes in January 2018 and the second with significant additional restrictions likely to take effect in 2020.

In 2017, a practical (hands-on) test requirement for M-44 licensing was added to ensure applicators can demonstrate the ability to safely use the M-44. The idea follows the practice used to certify Emergency Medical Technicians. M-44 licensing requires individuals to hold a pesticide license before being eligible to take the M-44 written or practical exam. The practical test for the M-44 applicant is focused on safety to help the applicant handle the materials in a safe setting. The test uses non-toxic capsules and requires applicators to show how to set an M-44, and it explains signage and safety requirements.

Applicators must submit use reports, M-44 Applicator's Monthly Report, in six-month increments twice a year to the office of the Vertebrate Pest Specialist. These reports summarize an applicator's daily use records applying M-44s. The first submission of materials covers January-June, and the second submission covers July-December. The paperwork requirements for using M-44s, though important, are tedious and burdensome for applicators. One of the use report requirements had asked applicators to identify the sets that were successful in taking a coyote. The sets consisted of kill sites (KS), draw station (DS), bone pile (BP), travel trail (TT), roadway (RW), stock water (SW), den area (DA) and other (O). That section of the use report is pictured in Figure 1.

This information is not required by the EPA label. The requirement may have been initially added to determine which type of sets had the most success or which sets may have had the most non-target takes. After consultation with representatives of the Montana DOA and Montana USDA-Wildlife Services and having no evidence that the information was ever put to use, the requirement was removed in 2019.

M-44 Use Report Data

Montana private applicator M-44 use reports for 2006 to 2019 have been summarized in Table 2. Non-target take percentages were calculated assuming worst case scenarios, namely that all unknown discharges and discharges where a carcass was not recovered were counted as killing a non-target animal. This calculation practice places the data in the most negative light. For several entries it is not clear that the discharge of a capsule resulted in an animal's death. For example, in 2012, two cartridges were lost to a bulldozer but were counted as killing a non-target in the Percentage Non-target column. Likewise, several explanations can account for why a carcass was not recovered, including scavengers removing the carcass, or the animal not receiving a lethal dose. Table 3 shows M-44 use by USDA-Wildlife Services personnel in Montana as a comparison (J. Steuber, pers. commun.).

# of Coyotes taken per the # of each set location made	KS	DS	BP	TT	RW	SW	DA	O (_____)
	/	/	/	/	/	/	/	/

Figure 1. Section of the Applicator's Monthly Report requiring identification of the type of M-44 sets successful in taking a coyote (requirement removed from report in 2019).

Table 2. MT private applicator M-44 use report data on target and non-target animals taken.

Dates	Coyotes/Foxes	Non-target	Unknown	Percentage Non-target
July 1-1974-June 30, 1975	608/148	23 skunks 6 raccoons 4 dogs 1 badger		4.5%
July 1, 41974-February 20, 1975 (Matheny 1976)	670/156	4 dogs 36 other animals		4.8%
2006	39/4		1	2.3%
2007	26/6		5	15.6%
2008	26/4	1 sheep foot	5	20%
2009	26/12	2 fox side pulls 1 magpie	3	15.9%
2010	53/11	1 raccoon		1.6%
2011	117/10	1 bird 1 magpie	1	2.4%
2012	80/16	1 skunk 1 raccoon 2 lost to bulldozer	6	10.4%
2013	74/9	1 raccoon	3	4.8%
2014	65/3		4	5.9%
2015	88/8	1 cow fired	4	5.2%
2016	75/18	2 fox chews	6	8.6%
2017	74/14		4	4.6%
2018	46/19		4	6.2%
2019	17/0			0%
Total 2006-2019	**806/134**	**17**	**46**	**6.7%**

Table 3. MT USDA-WS M-44 use report data on target and non-target animals taken.

Dates	Coyotes/Foxes	Non-target	Percentage Non-target
2006	489/53	4 skunks	0.74%
2007	510/55	3 skunks	0.53%
2008	509/36		0.00%
2009	575/29	1 red fox	0.17%
2010	646/30		0.00%
2011	677/31		0.00%
2012	747/40	1 feral dog 2 wolves	0.38%
2013	619/13	1 red fox	0.16%
2014	435/13	1 red fox	0.22%
2015	477/21	1 wolf	0.20%
2016	344/19	2 feral dogs	0.55%
2017	219/7		0.00%
2018	125/14		
2019	201/13		
Total	**6,573/374**	**16**	**0.23%**

DISCUSSION

M-44s, like many wildlife control tools, are frequently maligned using terms ranging between distortions to prejudicial and inappropriate framing (Vantassel 2009a). Perhaps the most significant distortion is the frequent designation of M-44s as "cyanide bombs" (Brown 2017, Thuermer and Wyofile 2017, Predator Defense 2019b). Given that M-44s use no gun powder or other explosive material, calling them bombs is little more than propaganda designed to inflame the uninformed. M-44s are also maligned as indiscriminate and therefore not considered an appropriate tool for managing damaging wildlife (Predator Defense 2019a, Western Environmental Law Center 2019). Several reasons suggest that the criticism is not reasonable. First, all trap-like devices are indiscriminate if the standard is absolute perfection in target specificity. The term "trap-like" means mechanical products that can capture or kill an animal without requiring the presence of a human to trigger the device. A device triggers when the appropriate mechanical movement causes it to fire, not whether the "right" animal is present. Capture technology has not advanced to the point that it can identify targets by species, nor is this just a problem with trap-like devices. Fishhooks are indiscriminate as they cannot determine if they are capturing a fish or a bird or a turtle. Second, indiscriminate does not mean that all trap-like devices pose equal risks to all creatures in the same way. M-44s have resulted in the deaths of non-target animals (Wiemeyer et al. 1986) (Tables 2 and 3). However, Tables 2 and 3 show that M-44s have high rates of targeting canines (Connolly 1988) when compared with other types of devices, such as footholds, snares, or cage traps (Novak 1987, Shivik et al. 2005, Way 2007). This comment is not intended to denigrate or express opposition to footholds or snares; it only points out that different devices have different records of non-target capture. Finally, not every device is suited for every situation (Linhart et al. 1986). It is simplistic to focus excessive attention on devices in isolation from the trapper and the situation (Vantassel 2009a). Proper evaluation of a tool requires assessments based on the device event that by necessity involve the skill and wisdom of the user to select the right device for the right setting and in consideration of the environmental conditions.

Various animal protectionist and environmental groups strenuously complain that M-44s endanger domestic dogs. One need only to view the video "Lethal Control" which highlights dogs killed by M-44s (Drysdale 2019). Lest one think this accusation is an outlier, consider the following quotes:

- "Dog deaths by M-44s are common-place. The statistics are much higher than what Wildlife Services publishes. According to whistleblowers, agents often don't even record the poisonings unless there are witnesses. Families are then left to wonder what happened to their dog." (Predator Defense 2019a)
- "The fact that Wildlife Services continues to state that M-44s can be used safely and that incidents of M-44s killing dogs and exposing people to poison are 'rare' is an outrage" (Predator Defense 2019a).

But how accurate is this criticism of M-44s? First, M-44s have taken dogs in Montana. Montana USDA-Wildlife Services' applicators have taken three non-target dogs in 14 years, while Montana private applicators did not report taking any in the same period. Thirteen individuals were licensed between 2006-2019 and they collectively took only about 1/7 of the animals taken by Montana USDA-Wildlife Services.

Dogs constitute a significant, and often overlooked threat, to wildlife and livestock. This includes not only dogs that are feral but also those whose owners allow to roam from their property (Boggess et al. 1978, Bergman et al. 2009, Young et al. 2011). Wildlife Services Fact Sheet (2018) cites National Agricultural Statistics Service (NASS) reports for 2011 noting that dogs were estimated to have predated on 21,800 livestock animals. In addition, the fact sheet cited a 2010 NASS report that estimated 220,000 cattle lost, with coyotes and dogs as the two top predators. Roaming dogs not only harass wildlife but also fail to recognize property lines, as when dogs are running ahead of their owners they can, and have, encountered M-44s, to fatal effect (Dayton 2017).

Livestock Losses

Montana M-44 Applicator Monthly Use Reports include a section for M-44 applicators to report any predation events that are associated with their activities (Table 4). Compensation is not provided for losses due to

Table 4. Predation reported in M-44 applicator monthly reports (Montana).

Year	Cattle Adult	Cattle Calf	Sheep Adult	Sheep Lamb	Total Value ($)
2006		2	100		9,414
2007		4	182	3	17,737
2008		3	76		12,700
2009	1	1	120		18,718
2010	6	6	44		16,610
2011		10	216	1	84,700
2012		12	18	10	17,840
2013	5	15	48	5	32,515
2014			9	11	3,481
2015		3	15	34	14,622
2016		4	15	97	23,840
2017	1	4	65	54	33,905
2018	12		16	11	19,111
2019			4		1,132
Total	25	64	928	226	306,325
Total	**$26,190**	**$57,807**	**$186,675**	**$35,653**	**$306,325**

Table 5. Average yearly livestock prices for Montana ($).

Year	Cattle Adult	Cattle Calf	Sheep Adult	Sheep Lamb
2006	668*	707**	80*	85*
2007	649*	685**	81*	85*
2008	800	560	145	100
2009	700	618	145	100
2010	915	680	160	125
2011	1250	890	350	200
2012	1455	950	280	140
2013	1300	975	225	118
2014	1800	1300	190	161#
2015	1700	1450	270	183
2016	1100	1000	288	160
2017	1200	1000	317	150
2018	1025	975	326	145
2019	1100	875	283	145

*Number calculated by averaging USDA Livestock heifer cwt prices for year and multiplying by 6. Ewe price based on yearly average of USDA Livestock ewe cwt prices and multiplied by 2. Lamb price is based on average of USDA Livestock slaughter price for year. All numbers rounded off to nearest whole dollar (USDA Economic Research Service).
**Number calculated by averaging USDA Agricultural Marketing Service Report https://marketnews.usda.gov/mnp/ls-report-config [marketnews.usda.gov] Cattle, feeder & replacement, weighted avg. steers, annual, all MT, medium and large, 1, 600-650 weight for a given year. Averaged the lines designated as calf then multiplied cwt prices by 6, rounded to nearest whole dollar.
USDA Agricultural Marketing Service Report for all lambs across the nation. The average was $321 which was such an outlier that I divided it in half.

coyote or fox predation nor are the incidents verified by a third party. While the data provided could include deaths caused by illness or environmental conditions (Alt and Eckert 2017), it is highly unlikely that every loss stems from causes other than predators. Readers should also consider the possibility that not every loss to predation was accounted for. Those wishing to consult other data should look to the USDA National Agricultural Statistics Service, which provides data on predation losses at national and state levels (https://usda.library.cornell.edu/catalog).

Livestock values used to calculate dollars losses in Table 4 are taken from the Montana Livestock Loss Board unless otherwise indicated (Table 5). The Board determines its valuations of cattle and lambs based on USDA Market Reports and ewe values on the annual Miles City Ram & Ewe Sale (Montana). Dollars have not been adjusted for inflation. Although the total dollar amounts are not staggering, readers should consider that losses are not necessarily evenly distributed amongst producers and should look at those dollar valuations from the perspective of a producer trying to earn income.

CONCLUSION

For livestock producers and herders, predator control plays an important part in animal husbandry. Animals lost to predation or suffer reduced weight gain due to the stress of predator presence (Laporte et al. 2010) add an additional strain to thin profit margins and the whims of the commodity market. M-44s are not the only tool available, but they are an important one because they are easy to use, cost-effective, and are canine-specific when compared to other control techniques.

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