Human Health and Ecological Risk Assessment
for the Use of Wildlife Damage Management Methods
by USDA-APHIS-Wildlife Services

Chapter IV

THE USE OF FOOTHOLD TRAPS IN WILDLIFE DAMAGE MANAGEMENT

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EXECUTIVE SUMMARY

Foothold traps are used by USDA-APHIS-Wildlife Services (WS) Program for specific wildlife damage management (WDM) projects, mostly involving wildlife that are causing damage to property, agriculture, and natural resources or protecting human health and safety. Implementation of program-specific measures designed to reduce human interactions with traps reduces the risk of these types of management tools to the public and workers, and WS will continue to evaluate and implement, where appropriate, new protection measures. Advancements in trap use and design have resulted in more effective and humane trapping of target animals while reducing the potential for nontarget captures in foothold traps. In fact, nontarget capture has decreased in the last 25 years from a nontarget capture rate of 23.3% in FY88 (USDA 1997, Appendix P, pp. 23-27) to 5.9% annual average between FY11 and FY15 in the 6 states (AZ, CO, NM, OK, TX, and UT) analyzed. The use of pan tension devices, with most being implemented in the 1990s, likely accounted for the largest portion of the decrease. Additionally, target take has decreased five-fold from FY88 to FY11-FY15, from a total take of 21,992 to 4,244 (19.3%) in USDA (1997, Appendix P, pp. 23-27). This data indicates that foothold trap use has declined significantly and that their use is more selective for the target animal. WS will continue to support and conduct research and education that supports more humane and effective trapping methods and will implement these measures in programs, where appropriate, to further reduce risk to nontarget animals.

Overall, the risks to human health and safety and the environment from the use of foothold traps are minimal. WS personnel are professional with their use of foothold traps and try to minimize the identified potential risks. Wildlife Services maximizes humane capture by using foothold traps recommended by the Association of Fish and Wildlife Agencies (2016) Best Management Practices program.

Table of Contents

1 INTRODUCTION

Figure 1. Standard No. 3 trap used by APHIS-WS for trapping coyotes for many years (most have been replaced or laminated to meet BMP standards). This is a double long-spring trap. This is an off-set, metal-jaw trap which is being replaced by padded-jaw- or laminated jaw- traps consistent with best management practices (BMP) standards. The jaw spread is just over 5".

The U.S. Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), Wildlife Services (WS) Program uses foothold traps to conduct wildlife damage management (WDM) to protect public and private landowners from losses to agricultural and natural resources, and to protect human health and safety and property. Foothold traps, often incorrectly called leghold traps, are mechanical devices designed to capture animals by gripping an animal's foot. A foothold trap consists of a pair of metal jaws sometimes covered with rubber pads or laminated (this makes the jaws thicker to reduce injury), powered by springs, a base to attach the springs and jaws, and a pan triggering mechanism to hold the trap in the set position until activated by an animal. In addition to these traps, a few new trap styles are available for raccoons[1] (e.g., dog-proof raccoon trap, and foot-encapsulated trap) that exclude many nontarget species. Foothold traps are available in a variety of sizes (Figures 1, 2, and 3) depending on the type of animal to be captured and the manufacturer, including:

- No. 0 -- Small rodents
- No. 1 -- Muskrat, Weasel, Birds
- No. 1½ - Muskrat, Mink, Skunk, Birds
- No. 2 -- Raccoon, Mink, Fox, Skunk
- No. 3 -- Coyote, Fox, Bobcat, Badger
- No. 4 -- Coyote, Beaver, Bobcat
- No. 4½ - Wolf, Mountain Lion

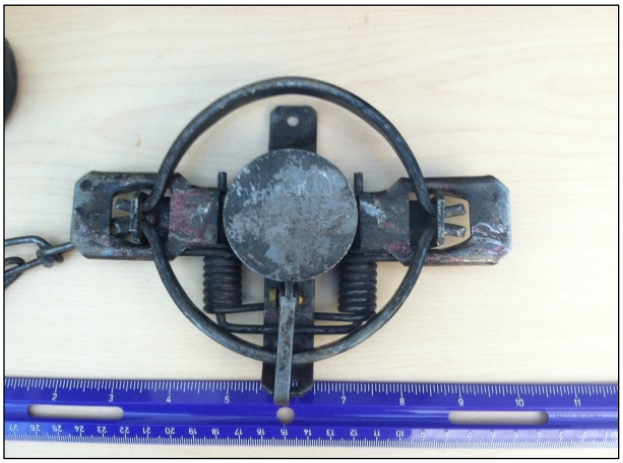

Figure 2. Typical #2 coil spring trap. Coil spring traps with a spring removed, and often a smaller size trap, are typically used for trapping birds; the traps are set on poles and the pan replaced with a perch (pole trap).

Trap size is generally determined by the spread of the trap jaws, but may differ somewhat among manufacturers[2]. Foothold traps designed to capture birds are placed on perches or are set on poles. The springs for bird traps are modified to reduce the force with which they close to avoid injuries.

Foothold traps are a commonly used wildlife damage management (WDM) method by the Wildlife Services (WS) program and are used in both terrestrial and aquatic habitats nationwide, following state or local regulations. WS uses foothold traps on both public and private lands, and in rural or urban areas. Foothold traps are a versatile tool used by WS to capture a wide variety of mammalian species from muskrats to wolves and perching or large birds. It should be noted that some animals such as coyotes are difficult to trap with other devices such as cage traps and foothold traps are considered the most efficient method to capture

[1] See the Risk Assessment Introduction (Chapter 1) for scientific names of animals. These will only be given if they are not used in that Chapter.
[2] WS may use trade names or show specific traps, but this does not constitute a recommendation for these traps.

them. WS may relocate or kill animals caught in foothold traps depending on the circumstances of capture. In aquatic habitats, foothold traps may be used in submersion sets.

Depending on the target animal, a foothold trap, usually with an attractant, may be placed on or near the travel path of a target species, at typical perch sites for birds, in water near "slides" for beaver, at the entrance of burrows, or wherever a target animal is expected to travel, or has previously left sign. Trap placement varies according to the target species, habitat type, and the presence of nontarget animals. Most terrestrial sets for mammals are placed underground with dirt or debris (e.g., leaf litter, rotting wood, pine needles, or ant pile granules) sifted on top. Bait, scent, lures, or carcass "draw stations" may be used as attractants. Foothold traps in aquatic sets are typically placed in somewhat shallow water where animals come and go from land or near lodges or burrows; scent may be used for aquatic mammals, especially for beaver.

Figure 3. Standard No. 3 padded coil spring trap used by WS mostly for coyotes. This trap is sprung, but in a standard set.

Birds are trapped on poles or the ground in places where they typically roost, near damage sites, or where safety concerns are occurring. Most birds are caught at airports or for the protection of threatened and endangered (T&E) species such as the California Least Tern (*Sterna antillarum browni*) and Western Snowy Plover (*Charadrius nivosus nivosus*) (Butchko 1990). Most bird traps or pole traps are made with a No. 1 or 1½ traps with spring tension reduced, according to WS policies, with the exception of those for eagles and larger birds of prey which require a greater jaw spread.

Another type of foothold trap that can be used to live-capture raccoons and opossum are enclosed foothold traps, often called dog-proof traps. These traps can have metal jaws and power-activated snare cable to hold the foot (the cable restraint enclosed foothold are included here because so few are used). Enclosed foothold traps require a raccoon or opossum to reach inside the opening of an enclosed trap to get the bait. The bait is generally inserted onto or near the trigger, which is recessed approximately 2 to 3 inches inside the trap. The trap generally requires the target animal to pull on the trigger to activate it, but some designs allow the trigger to be pushed as well. When the target animal trips the trigger inside the enclosed trap, the spring that was being held compressed by the trigger is released causing a metal arm or cable to close quickly over the animal's foot. The foot of the animal is held inside the enclosed trap. The opening into the enclosed trap is narrow (normally 1.5 inches in diameter), which prevents animals much larger than a raccoon from accessing the trigger. The enclosed foothold trap can be placed above ground or buried underground with only the opening exposed to simulate a hole in the ground with a food cache. The enclosed foothold trap is anchored to the ground or nearby vegetation.

Foothold traps are primarily used by WS specialists for coyotes, raccoons, beaver, foxes, bobcats, and other small predators, but more recently have been used more frequently for wolves. Live capture and relocation is

used most for Red-tailed Hawks, American Kestrels, other raptors, and raccoons and some wolves. Nearly all raptors are captured at airports as part of WS efforts to reduce wildlife-aircraft collisions.

In 1996 the Association of Fish and Wildlife Agencies (AFWA), working cooperatively with federal and private partners, embarked on a goal to develop voluntary Best Management Practices (BMPs) for trapping furbearers in the United States (Batcheller et al. 2000). The stated purpose and intent of AFWA in developing the BMPs was to: "*Scientifically evaluate traps and trapping systems used for capturing furbearers in the United States*." AFWA determined the best methods by species[3], but was primarily targeting harvest by private fur trappers and not take in WDM activities. Evaluations of trap performance were based on animal welfare, efficiency, capture rate, selectivity, practicality, safety, mechanical function, cost, quality, durability, weight, and maintenance requirements (Fall 2002). Science-based literature and research on the variety of traps and snares were used by AFWA to develop the BMPs. The evaluation of BMPs continues and BMPs are updated as research results warrant (AFWA 2016). BMPs were provided to state and federal wildlife agencies as well as trappers and the public in the form of a general overview for traps and trapping, and specifically the most efficient and humane methods for trapping 24 furbearer species in the United States (AFWA 2016). The goals were to promote regulated trapping as a modern wildlife management tool, identify practical traps and trapping techniques while continuing to improve efficiency, selectivity, and the welfare of trapped animals through research, to provide specifications for traps that meet BMP criteria for individual species in various regions of the United States, to provide wildlife management and trap industry professionals with information to evaluate trapping systems in the United States; and to instill public confidence in and maintain public support for wildlife management and trapping through distribution of science-based information. AFWA (2016) focused on private trappers and realized that trapping for depredation control was different. The BMP program utilizes international humane trapping standards consistent with the Agreement on International Humane Trapping Standards among Russia, Canada, and the European Union. WS has adopted these standards, where feasible, for trapping in the United States and conducts research on different trapping systems.

WS Policy (WS Directive 2.450, 09/24/2014) states that the use of the BMP trapping guidelines developed and promulgated by AFWA (2016) for private fur harvest and other trapping activities are valuable and should be followed as practical. WS uses the BMP guidelines as the basis for policy formulation, but recognizes that some foothold traps used in WDM are not commercially available and that not all devices recommended in the BMP guidelines for general public-use meet the more stringent performance requirements, particularly for efficiency and durability, for use in federal wildlife management activities. The Directive also discusses the fact that foothold traps need to be set so that captured animals are not conspicuous to the public, particularly along public roads and trails; this reduces the possibility of a member of the public attempting to free an animal and getting injured and trap theft. Foothold traps are typically placed in areas where the public will not haphazardly stumble onto a trap or a trapped animal. The Directive also states that foothold traps are not to be set closer than 30 feet from any exposed animal carcass, or part thereof, to reduce the potential of capturing raptors or other nontarget animals attracted to it[4]. Foothold traps must also incorporate pan-tension devices to prevent or reduce the capture of nontarget animals, unless such use would preclude capture of the intended

[3] Furbearers with AFWA (2016) trapping BMPs include Virginia opossum, beaver, muskrat, nutria, Canada lynx, bobcat, coyote in Eastern U.S., coyote in Western U.S. (both eastern and western United States populations have own BMPs since eastern coyotes are larger as a result of hybridizing with wolves), gray wolves, red fox, swift/kit fox, arctic fox, gray fox, river otter, fisher, American marten, weasel (least, long-tailed, and short-tailed), mink, American badger, ringtail, raccoon, and striped skunk. These are individual documents for each species and can be found at the AFWA website (2016).

[4] If an animal carcass could be dragged or moved by scavengers to within 30 feet of set foothold traps, the carcass has to be secured to restrict movement (WS Directive 2.455, Scents, Baits, and Attractants). These restrictions do not apply to animal carcasses used to attract bear (foothold traps cannot be used to capture bear) or mountain lion for approved capture devices, including foothold traps.

target animals. It also states that foothold traps equivalent to size No. 3 or larger, when used in restraining sets, are limited to types with smooth, rounded offset jaws that may or may not be laminated or padded jaws, and that foothold traps with teeth or spiked jaws are prohibited (WS Directive 2.335, Wolf Damage Management). The Directive also notes that agency foothold trap replacements are to be selected from the various commercially available devices or equivalents listed in BMP regional guidelines for each species (AFWA 2016), unless changes are authorized by the WS Regional Director.

The same Directive provides guidelines for pole traps. It allows foothold traps to be set on poles or roosting structures to capture birds causing damage or considered a human health or safety risk under the appropriate federal, state, or local special purpose permit. WS personnel authorized to capture birds under a permit will have it in their possession. Foothold traps used as pole traps will not exceed No. 1½ foothold traps, but this does not preclude the use of larger, modified traps to capture eagles. The Directive requires pole trap springs to be modified to produce the lightest jaw closure sufficient to catch and hold the target raptor and sufficient padding to reduce the possibility of injuring a raptor's leg. To reduce unnecessary stress to the captured birds, traps are checked at least twice daily, but not less than required by appropriate permit. A slide wire, or similar device, is used to allow the raptor to slide to and rest on the ground after capture which minimizes injuries and stress.

1.1 Use Pattern

From FY11 to FY15, APHIS-WS captured an average annual total of 12,043 target animals (94%) of 84 species and 779 nontarget (6%) of 98 species and 1 species group (maximum of 100 species) (Table 1) with foothold traps. Of the targeted animals, 792 were relocated or released after sampling (7% of targets). Of the nontarget species, 258 were released (33%) following capture; those expected not to survive were humanely euthanized. Traps were used in 48 states, 2 territories, and Guantanamo Bay, with 27 states having a take of more than 100 animals. The most common target species taken annually with take exceeding 1,000 for each species were coyotes, raccoons, and beavers. The most common nontarget species were raccoon, striped skunk, badger, Virginia opossum, coyote, and bobcat with take exceeding 40 for each species.

Animal capture trap night is a standard comparison measurement of effectiveness or selectivity for all types of mammal traps that remain in place for one or more nights. With foothold traps placed for mammals, trap nights can be determined from Management Information System (MIS[5]) records. Pole traps for birds were not included since these are almost always set and taken down daily. In a few cases, foothold traps and not pole traps were used to capture birds and set on a daily basis, but these cannot be separated from the other take with foothold traps due to reporting procedures into the MIS and ability to query the data. Where traps were set daily for several days in a row, trap nights would be calculated. However, these would equate to a minimal number of trap nights and would be included in the summaries for trap nights. The few target birds taken with foothold traps, which are usually placed on a platform rather than a pole, included an annual average of 24 killed and 38 relocated. From FY11 to FY15, WS used non-padded foothold traps, which includes BMP approved laminated traps, for a total of 1,039,387 trap nights, padded foothold traps 100,136 trap nights, and dog-proof traps 12,786 for a combined total 1,152,309 trap nights. An annual average of 12,656 animals were captured in foothold traps for a total of 11.0 animals/1000 trap nights, with 94.0% target species and 6.0% nontarget species. Thus, for these figures, target animal take was 10.3/1000 trap nights and nontarget take was 0.7/1000 trap nights. Of the 11,899 target captures with foothold traps, 5.7% were

[5]MIS - Computer-based Management Information System used for tracking WDM activities. Throughout the text, data for a year (i.e. FY11 to FY15) will be given and is from the MIS. MIS reports will not be referenced in the text or Literature Cited Section because MIS reports are not kept on file. A database is kept that allows queries to be made to retrieve the information needed.

relocated. Of the 757 nontarget captures, 33.0% were released at the capture site. These figures represent a high effectiveness rating for target mammal capture with a very low take of nontarget animals. In the hands of a skilled trapper, foothold traps are one of the most selective and efficient means available for removing problem animals.

Table 1. The annual average number of target and nontarget animals captured with foothold traps by APHIS-WS in WDM activities from FY11 to FY15 throughout the United States. Individual accounts of species are given only for those species that had an annual average of more than 10 taken, target and nontarget numbers combined. However, all federally listed threatened, endangered, or candidate species and eagles are included.

ANNUAL AVERAGE SPECIES TAKEN WITH FOOTHOLD TRAPS (INCL. POLE/DOG-PROOF TRAPS)				
	TARGET		NONTARGET	
Species	**Killed**	**Released**	**Killed**	**Released**
Virginia Opossum	177	2	25	22
Feral/Free-roaming Cat*	15	3	4	8
Bobcat	284	9	9	34
Mountain Lion	39	0.2	0.6	1
Coyote	5,316	11	30	13
Northwestern Gray Wolf (*Canis lupus occidentalis*)	48	21	0.2	0.6
- Great Plains Wolf[T&E] (*C. l. nubilus)*	196	29	0	0.2
- Mexican Gray Wolf[T&E] (*C. l. baileyi*)	0	1	0	0.8
- Feral/Free-Roaming Dog* (*C. l. familiaris*)	51	19	2	29
Red Fox	357	3	14	14
Arctic Fox	64	0	0	0
Common Gray Fox	444	1	18	16
Black Bear	2	0.4	4	16
Grizzly Bear[T&E]	0	0.4	0	0.4
River Otter	2	0	18	0.6
Badger	169	3	35	14
Raccoon	2,003	41	178	34
Striped Skunk	183	0.2	85	4
Other Predator (6T, 6NT – 10 sp.)[1]	4	0.2	10	2
Feral Swine*	38	0	1	0
Other Hoofed Mammal (2T, 8 NT – 8 sp.)[1]	2	0.2	8	18
Beaver	1,550	0.4	0	0
Nutria*	38	0	2	0
Muskrat	66	0	10	0.6
Mountain Beaver	10	0	0	0
Yellow-bellied Marmot	35	0	0.6	0
Woodchuck	19	0	1	0.4
Porcupine	11	0	21	4
Other Rodents/Rabbits/Armadillo (165T, 16NT – 25 sp.)[1]	17	0	17	2
Bald Eagle	0	0	0.8	0.4
Red-tailed Hawk	11	236	0	0.2
Golden Eagle	0	0.2	0.2	0
American Kestrel	55	220	0	0
Great-horned Owl	3	37	0	0.4
Common Barn Owl	2	11	0	0
Other Raptor (16T, 5NT – 17 sp.)[1]	5	28	5	5
Double-crested Cormorant	0	114	0	0
Other Non-passerine Bird (4T, 19NT – 21 sp.)[1]	1	0	16	5
Common Raven	21	1	1	1
Other Passerines (7T, 12NT - 13 sp.)[1]	13	0.2	4	2
Reptiles (0T, 5NT+1 Group# - 7NT max)[1]	0	0	1	9
AVE. ANNUAL NO. ANIMALS (84T, 100NT – 133 sp.)	**11,251**	**792**	**521**	**258**
% OF ALL TARGET AND NONTARGET SPECIES TAKEN	**87.7%**	**6.2%**	**4.1%**	**2.0%**

[1]* See Appendix 1 for other species taken * Introduced Species # Unidentified Turtles

T&E Federal threatened and endangered species T – Target NT - Nontarget

2 HAZARDS

2.1 Health and Human Safety

Human health and safety hazards associated with foothold traps include potential cuts, abrasions, bruises, or possibly bone fractures of the hands or fingers from the accidental discharge of a trap. Generally, most injuries occur while setting or placing traps which make the WS personnel using foothold traps most susceptible to such injuries. The setting and removing of foothold traps requires repeated bending, kneeling, and pounding and pulling stakes from the ground which may lead to back strains. The removal of animals from foothold traps may lead to bites or scratches.

Members of the public may come into contact with foothold traps. Because traps are set underground and "camouflaged" under sifted dirt or other debris, most contact would be to the foot from the trap being stepped on. Trap size would make a difference regarding the potential for the foothold trap to injure the public. The most common trap used is a No. 3 which has jaws about 4" x 5.5" which could potentially close around a small child's foot or someone's toes. It is possible that someone disturbing a trap site could have their hand on the ground and cause the trap to close on their fingers, but this is highly unlikely. To mitigate such possibilities, WS personnel post signs at entrances to properties, or on roads in the area, to alert the public that traps are present. Finally, it is possible for someone to find a captured animal and attempt to free it which could expose them to bites or scratches as well as the traps.

2.2 Environmental

The environmental hazards associated with foothold traps include the injury or death of target and nontarget animals. Animals may die from exposure to the elements such as heat or cold, other causes associated with capture, or euthanasia by the WS specialist. Foothold traps may accidentally capture nontarget animals including other wildlife species, domestic animals, or livestock (Table 1 lists nontarget species captured from FY11 to FY15). Injuries to animals include cuts, sprains, strains, broken bones and the disruption of circulation. Injuries may result from the closure of the trap, the animal attempting to escape, and length of time the animal remains in the trap. The BMPs (AFWA 2016) provide standards to minimize injuries from trapping by incorporating findings from past and new research. Much research had been done on selectivity, injuries, humaneness, and other characteristics related to traps which provided AFWA (2016) a good starting point.

Olsen et al. (1986) reported that cutaneous lacerations were the most common injury for coyotes captured in unpadded (60% occurrence) or padded traps (48%). Phillips et al. (1992) reported similar results when comparing the incidence of injuries to coyotes between padded traps and two different types of unpadded long spring traps. Onderka et al. (1990) reported similar types of injuries to coyotes with unpadded traps which had the highest damage score followed by Novak snares and padded-jaw traps, with the least damaging trap being Fremont snares (snares are covered in another Risk Assessment, but it is a useful comparison). The Fremont snare has also been shown to cause the least amount of injury in trapping lynx (*Lynx canadensis*) when compared to the padded foothold trap (Mowat et al. 1994). In addition to physical impacts to target and nontarget animals, physiological and behavioral changes can occur and will vary based on the type of foothold trap being used and how long animals are held. Kreeger et al. (1990) demonstrated that red foxes held by foothold traps had elevated levels of adrenocorticotropin, β-endorphin, and cortisol when compared to controls. These hormones or neurotransmitters are indicative of a physiological stress response in mammals. Trapped foxes also had a higher incidence of adrenal gland, and heart and lung effects when compared to controls; however, the impacts were not considered to be life-threatening. Differences in padded versus non-

padded foothold traps were also noted showing that the padded traps reduced physiological impacts when compared to non-padded traps. Similar responses as well as additional physiological and behavioral impacts have also been noted in other animals held in traps such as European badgers (*Meles meles*), raccoons, and American black bear (Schutz et al. 2006, Proulx 1993, Powell 2005). Padded-jaw foothold traps consistently demonstrated a reduced risk of injury and stress to target wolves and nontarget animals (Turnbull et al. 2013). However, their success rate was not as high as regular steel-jawed foothold traps. Padded-jaw foothold traps had fairly similar take for coyotes as steel-jawed foothold traps, though. Other than potential injury to animals, foothold traps are not expected to cause other damage to the environment.

The enclosed foothold trap, dog-proof trap, is designed to target animals that are capable of reaching inside the narrow entrance of the trap (normally 1.5 inches in diameter) to push or pull the trigger, which reduces the risk of nontarget animals from being captured, such as dogs or coyotes. The triggers are generally recessed 2 to 3 inches inside the trap, which excludes many potential nontarget animals from reaching inside the narrow entrance and pulling or pushing the trigger.

3 RISKS

3.1 Health and Human Safety

The risk of human injury is mainly to WS personnel placing foothold traps. Injuries related to traps closing on fingers are relatively minor. Most injuries are associated with larger traps, No. 4 and 4½ wolf and beaver traps[6]. WS employees engaged in trapping receive trapper education training to reduce risk of injury. WS personnel are encouraged to use gloves[7] and job aids including stake pullers and trap setter devices to minimize injury risk.

WS field and office employees filed an annual average of 79 Office of Workmen's Compensation (OWCP) claims for strained backs, lacerations, animal bites, burns, and other injuries that occurred on the job from FY13 to FY15. Of these, an annual average of 2.3 (1.3 compression/contusions, 0.7 lacerations, and 0.3 accident) were related to setting foothold traps with contusions and lacerations the extent of injuries. Additionally, WS employees had an average of 19 injuries from falls, slips, twists, and repetitive activities that resulted in lacerations, sprains, contusions, strains, compression bruises, and fractures that were associated with field activities, but the injury was not readily associated with any specific activity such as setting foothold traps. Considering the number of employees (~1,900), these claims are relatively few for the number of hours spent afield (the OWCP claims from FY13 to FY15 also includes office employees and injuries such as carpal tunnel syndrome). Thus, risks of setting foothold traps are relatively minor to employees.

The risk of injury from captured animals is also minimal. Typically, employees dispatch captured target animals with a gunshot to the brain[8]. The highest risk is typically from animals that are trapped in foothold traps that are not staked, but are attached to drags; employees may accidentally come across a hidden animal that is trapped when approaching the location of the set. Few employees over many years have been injured by such captured animals. WS personnel enter trapping areas cautiously and know where traps with drags *versus* stakes are placed using extra caution in these situations. A more obvious risk is associated with the release of captured animals. WS employees usually carry a catch-pole (a pole with a cable loop that can hold

[6] Small traps (#3 or less), especially those with long springs, are not likely to cause injuries to people.

[7] Setting traps may sometimes require free hands and gloves may not be worn at all times.

[8] WS personnel are trained and certified to use firearms which results rapid euthanasia and this is discussed in the Firearms Risk Assessment.

an animal prior to release). Catch-poles are very effective in handling wildlife, but an animal's behavior following release, though mostly predictable, is a primary concern. If an animal is too large, is in an area where the use of firearms would cause a safety concern, or is being trapped for a research project, an animal may be immobilized or euthanized with drugs; though usually not a problem, drugged animals can also be a risk[9] which will be discussed separately under the Immobilization and Euthanasia Risk Assessment.

From FY13 to FY15, WS operational field personnel annually averaged 3 bites or injuries annually from animals and some of these were from trapped animals. One was a coyote captured in a foothold trap that bit the employee before it was euthanized. Another bite was from a feral cat that had been caught and released from a foothold trap; the cat bit the WS employee while it was in the process of being transferred to a local animal shelter. Another feral cat was captured in a cage trap and bit the WS employee while transferring custody. A black bear in a culvert trap bit a WS employee on the hand before being released after relocation. Two WS employees were bit by feral or free-roaming dogs being hand gathered, but one escaped capture. Finally, a bat that was caught by another agency, bit a WS employee while the bat was being sampled for a variety of diseases (primarily rabies). Two other dog bites occurred from dogs at private residences while WS personnel were making contact with people requesting WS assistance. For context, WS operations annually killed 43,576 and released 11,432 predators with methods conducive to being bitten from FY13 to FY5. Thus, an average of 2.3 bite incidents were related to capturing them alive while hand gathering (0.7), transferring custody to another agency after capture (0.7), relocating an animal (0.3), in the process of euthanizing a live-captured animal (0.3), and while handling an animal for disease sampling (0.3). For bite incidents that occurred from released animals (2.0), WS had a ratio of one bite per 5,700 releases. For animals to be euthanized, the ratio was much less at 1 bite for 145,000 animals killed. Overall, the bite ratio was 1 bite for every 18,000 animals captured with methods where the animal would be captured alive. This is a minimal risk.

It should be noted that 2 bites in three years occurred as dog attacks; this again is a minimal number as the Centers for Disease Control (2015) estimates 4.5 million dog bites alone occur annually throughout the United States. Thus again, we believe these risks are minimal and well within the norms.

In addition to field personnel, from FY13 to FY15, NWRC personnel received an annual average of 1.0 animal bites or injuries from research animals with bites from a skunk (0.3) and a rat (0.3), and a bone fracture from feral swine (0.3). Lab animal bites typically come from caged animals during routine maintenance or research. It is not known whether these particular animals were from trapped animals from research that was being carried out in the field.

WS personnel could be exposed to animals carrying diseases such as rabies. All recorded bites from FY13 to FY15 and an annual average of two lacerations/splashes were from potentially diseased animals (rabies). Only one coyote bite (0.3) was from an animal in a known foothold trap and another, a cat bite, was from an animal caught in a foothold trap, but occurred when the animal was in the process of being transferred to another agency. The remaining bites had the potential for transmitting the rabies virus. None of the animals involved in the incidents was identified as subsequently rabid with the exception of fluids from tissue from a known rabid skunk that splashed into the eye of a researcher. Thus, a potential for 5 animals per year caused concern potentially for exposure to rabies from FY13 to FY15. Personnel that have the potential for exposure to rabid animals, have the option of obtaining the rabies prophylactic series with follow up boosters to reduce the potential for contracting the disease if exposed through a bite, laceration, or contact with animal fluids.

[9] WS personnel are trained and certified to use immobilization and euthanasia drugs and risks associated with their use are discussed in the Immobilization and Euthanasia Drug Risk Assessment.

General exposure to animals is common for many WS employees, but considering the number of animals captured or handled, the risk of contracting a wildlife-borne disease is minimal.

The placement of foothold traps in urban and rural areas may expose the public to trap sets; however, WS conducts WDM mostly on private lands where the risks are principally to WS employees and the landowners that receive WS assistance. Foothold traps are mostly placed in areas not visible or visited by the public. WS personnel consider the potential for the public to be in an area and generally do not use traps where people would frequent for three reasons: 1) the potential for the public to be exposed to a captured animal, 2) the potential for persons, particularly small children, accidentally stepping on a trap, or 3) the possibility of theft. To minimize the risks to human health and safety, the WS policy requires warning signs be posted at the entrance to areas where foothold traps are in use. Additionally, foothold trap sets are frequently underground with dirt or other natural debris sifted over them, camouflaging the sets from both animals and humans. Someone with knowledge of trap sets could, however, disturb the sites or steal the traps. Since traps are often set in remote areas, mostly on private lands, and camouflaged, the likelihood of incidental public contact is minimized. Additionally, WS has received no reports of members of the public being injured by a set trap from FY11 to FY15, and for that matter, over the last 25 years. Considering the number of trap nights in a given year (1.1 million), the risk of public exposure is negligible.

3.2 Environmental

WS recognizes that foothold traps may result in some risk of injury or death for nontarget wildlife and domestic animals (7.2% chance of catching a nontarget species – Table 1). WS supports efforts to make foothold trapping as humane as possible for the target species as well as minimizing impacts to nontarget vertebrates and is actively involved in research efforts to minimize impacts (Fagerstone and Keirn 2012). WS recognizes the BMPs for trapping as developed by AFWA (2016) emphasize animal welfare, efficiency, selectivity, practicality, and safety and will use these guidelines when conducting trapping programs. The risk of capturing nontarget animals is minimized by the selection of the suitable trap size, use of pan-tension devices, selection of the proper bait, lure or attractant, and appropriate trap placement. All of these issues are addressed in trapper education programs required of WS personnel and reinforced during annual meetings by discussion with experienced trappers. Additionally, supervisors monitor WS personnel and ensure that trapping is carried out humanely and efficiently.

Selecting the proper trap size can reduce the risk of catching animals larger than the target species because they can pull free if the trap is activated. Pan-tension devices reduce the risk of capturing animals which weigh less than target animals. Turkowski et al. (1984) reported nontarget exclusion efficiency rates of 92, 95 and 100% for shear-pin, leaf spring, and steel tape tension devices, respectively compared to 6% for the standard trap set for coyotes. Kamler et al. (2000) used pan-tension devices to show a reduced rate of nontarget captures in foothold traps designed to trap coyotes and bobcats. Nontarget captures were greatest for raccoons which have body weights in the range for the target species and would not be feasible to exclude from trapping. Kamler et al. (2002) reported 100% exclusion for the swift fox and skunk in padded traps using a pan-tension device while trapping coyotes. Kamler et al (2008) reported an exclusion efficiency of 93% for nontarget animals using soft-catch foothold traps and pan-tension devices while still providing effective trapping efficiencies for the black backed jackal (*Canis mesomelas*). The use of baits, lures, and attractants that are preferred by the target species minimizes the chances of capture of nontarget species. Jojola et al. (2009) demonstrated an approximate two fold probability of capture for nutria using attractants. The attractant allows for more targeted management of vertebrates and will reduce the potential for trapping nontarget vertebrates. The home ranges, habitat preferences, travel corridors, population densities of both target and nontarget species are considered when selecting locations for the placement of foothold traps. WS policy

requires that foothold trap placement be a minimum of 30 feet away from animal carcasses, often used as "draw stations," to minimize the risk of capturing scavengers (WS Directive 2.455). Signs warning of the placement of foothold traps in the area alert people to the presence of traps. The signs advise people to restrain pets or their livestock from going to the area being trapped to minimize the risk of accidental capture.

From FY11 to FY15, WS personnel took an average of 779 nontarget animals. The most common species taken were raccoons (27%), striped skunks (11%), badgers (6%), opossums (6%), coyotes (5%), and bobcats (5%) which accounted for half of the nontarget species taken. The most common taken lethally were raccoons (34%), striped skunks (16%), badgers (7%), coyotes (6%), and North American porcupine (4%). The number taken for any species, especially lethally, was minimal and all species were common except for grizzly bear and wolves. Of these, all were freed except for one northwestern gray wolf which is no longer a T&E species. Thus, take for the less common species was minimal. WS consults with the U.S. Fish and Wildlife Service under Section 7 of the Endangered Species Act and take was all within the levels authorized. WS did not jeopardize any species population.

Of additional concern is the take of domestic animals. From FY11 to FY15, an annual average of 45 feral/free roaming nontarget animals were captured with 31 dogs, 12 cats, and 2 livestock; of these 2 dogs and 4 cats were euthanized and the remainder released. It is believed that the 6 animals euthanized were feral animals. This is a minimal number and supports that nontarget domestic animal risk of capture from foothold traps is very low.

4 UNCERTAINTIES AND CUMULATIVE IMPACTS

Uncertainty in this risk assessment is negligible as WS has over 100 years using foothold traps for WDM activities and understands potential risks of using the variety of foothold traps available. The knowledge gained from this experience has helped reduce uncertainties.

Cumulative impacts could occur to target and nontarget animals. However, cumulative impacts are addressed in National Environmental Policy Act documents such as WS (2017)[10] and found not to be significant to any native population. Additional, the "Introduction to Risk Assessments for Methods Used in Wildlife Damage Management" looks at all take from all WDM activities by WS and none shows a significant level of take for any native species. From a human health perspective, the use of foothold traps in WDM will not have any known cumulative impacts.

5 SUMMARY

WS uses foothold traps as one tool in its damage management programs, typically as a component of an integrated approach to managing wildlife issues. WS works cooperatively with other natural resource agencies at the state, national and international level to develop effective and humane trapping measures while minimizing exposure to human health and nontarget animals. Implementation of program-specific measures designed to reduce human interactions with traps reduces the risk of these types of management tools to the public and workers, and WS will continue to evaluate and implement, where appropriate, new protection measures. In addition, advancements in trap use and design have resulted in more effective and humane trapping of target animals while reducing the potential for nontarget captures in foothold traps. In fact, nontarget capture has decreased in the last 25 years from a nontarget capture rate of 23.3% in FY88 (USDA 1997, Appendix P, pp. 23-27) to 6.1% average from FY11 to FY15 with the number of nontarget

[10] WS NEPA documents are available @ https://www.aphis.usda.gov/aphis/ourfocus/wildlifedamage/programs/nepa.

species killed dropping from 13.9% to 4.1% in 6 states (AZ, CO, NM, OK, TX, and UT) as analyzed in USDA (1997, Appendix P, pp. 23-27). The nontarget percentages was less in those states from FY11 to FY15 at 5.9%. The use of pan tension devices, with most being implemented in the 1990s, likely accounted for the largest portion of the decrease. Additionally, target take has decreased five-fold from FY88 to FY11-FY15, from a total take of 21,992 to 4,244 (19.3%) (USDA 1997, Appendix P, pp 23-27). This data indicates that foothold trap use has declined significantly and that their use is more selective for the target animal. WS will continue to support and conduct research and education that supports more humane and effective trapping methods and will implement these measures in programs, where appropriate, to further reduce risk to nontarget animals.

Overall, the evaluation of risks to human health and safety and the environment from the use of foothold traps are minimal. WS personnel are professional with their use of foothold traps and try to minimize the identified potential risks. The issue of humaneness is minimized by WS using the BMPs (AFWA 2016) as guidelines for foothold traps.

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7 PREPARERS

7.1 APHIS WS Methods Risk Assessment Committee

Writers for "Use of Foothold Traps in Wildlife Damage Management Risk Assessment":

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7.2 Internal Reviewers

USDA APHIS Wildlife Services

Reviewer: Michael Bodenchuk
Position: USDA-APHIS-WS, State Director/Supervisory Wildlife Biologist, San Antonio, TX
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Reviewer: Gary Littauer
Position: USDA-APHIS-WS, Assistant Regional Director/Supervisory Wildlife Biologist, Fort Collins, CO
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Reviewer: Alan May
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Reviewer: John Steuber
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APHIS Reviewer: Robert Gibbens
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APHIS Reviewer: Donald Herriott, DVM
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7.3 Peer Reviewers

The Office of Management and Budget requires agencies to have peer review guidelines for scientific documents. The APHIS guidelines were followed to have "The Use of Foothold Traps in Wildlife Damage Management Risk Assessment" peer reviewed. WS worked with the Association of Fish and Wildlife Agencies to have experts review the documents.

7.3.1 Peer Reviewer Agencies Selected by the Association of Fish and Wildlife Agencies

Reviewer: Association of Fish and Wildlife Agencies
Reviewer: Michigan Department of Natural Resources
Reviewer: New Mexico Department of Game and Fish
Reviewer: North Dakota Game and Fish Department
Reviewer: Pennsylvania Game Commission Bureau of Wildlife Management

7.3.2 Comments

Comments regarding the quality of the risk assessment and concerns:

1. Assumptions and uncertainties were addressed adequately, and references were appropriate.
2. Data was sufficient in the risk assessment to assess effectiveness and safety in the risk assessment.
3. Overall, I felt the risk assessment was well-written and included all pertinent information. I have no concerns or suggestions for improvement.
4. Document is well written and comprehensive. Thumbs up.
5. **Question:** Why the 30-foot setback?: **Response:** WS Policy is to use the 30 foot setback when using draw stations or other visible "bait" to reduce the incidence of nontarget take. This does not apply to the capture of mountain lions or other large predators, since pan-tension devices eliminates capturing most nontarget species. This is discussed in Footnote #4.

Peer reviewers provided a few editorial comments on the manuscript. These were appreciated and incorporated into the final document.

Appendix 1. "Other Species" Included in Tables.

Table 1

Other predator = small Asian mongoose, swift fox, kit fox, fisher, short-tailed weasel, mink, ringtail, hog-nosed skunk, hooded skunk, and western spotted skunks.

Other hoofed mammal = collared peccary, moose, axis deer, mule deer, white-tailed deer, pronghorn, feral cattle*, and feral sheep*

Other rodent and rabbit, and other mammal = black-tailed prairie dog, California ground squirrel, rock squirrel Richardson's ground squirrel, Columbia ground squirrel, arctic ground squirrel, eastern chipmunk, Nearctic brown lemming, Ord's kangaroo rat, eastern gray squirrel, fox squirrel, red squirrel, eastern woodrat, Mexican woodrat, bushy-tailed woodrat, cotton deermouse, marsh rice rat, brown rat*, black rat*, eastern cottontail, mountain cottontail, desert cottontail, European rabbit*, snowshoe hare, black-tailed jackrabbit, and nine-banded armadillo

Other raptor = turkey vulture, black vulture, osprey, white-tailed kite, Cooper's hawk, northern harrier, red-shouldered hawk, Swainson's hawk, rough-legged hawk, ferruginous hawk, snowy owl, barred owl, great gray owl, burrowing owl, short-eared owl, caracara, merlin and peregrine falcon

Other non-passerine = rock pigeon*, Eurasian collared-dove*, glaucous-winged gull, herring gull, Pomarine jaeger, greater white-fronted goose, Canada goose, mute swan*, wood duck, mallard, northern pintail, green-winged teal. Common eider, long-tailed duck, American bittern, great blue heron, snowy egret, sandhill crane, lesser yellowlegs, wild turkey and ring-necked pheasant

Other passerine = European starling*, red-winged blackbird, common grackle, black-billed magpie, American crow, Say's phoebe, western kingbird, Lincoln's sparrow, eastern meadowlark, western meadowlark, northern mockingbird, American robin and house finch

Reptile = American alligator, gopher tortoise, pond slider, southern painted turtle, common snapping turtle and unidentified turtle (0.4 released: SC – chicken turtle, pond slider, river cooter, and spiny softshell possible - 2 max)

* Introduced species