Appendix C
WDM Methods

Appendix C-1

WS-California Methods Descriptions

1 Site Presence

Wildlife Services-California's (WS-California) actions require presence at the locations where the wildlife damage is occurring. Before WS-California conducts any wildlife damage management (WDM), a request must first be received, and *Work Initiation Documents for Wildlife Damage Management* must be signed by the requesting landowner/administrator for private lands, or other comparable documents for public or tribal lands must be in place. WS-California may use 4-wheel drive vehicles, all-terrain vehicles (ATVs), snow machines, aircraft, boats, or hoof stock for conveyance when conducting Integrated Wildlife Damage Management (IWDM) activities. When operating on federally or state-owned lands, WS-California must comply with all applicable laws and regulations, as well as all terms and conditions set forth in any memorandum of understanding (MOU) negotiated with the relevant land management agencies.

2 Technical Assistance (All Species)

Technical assistance is provided by WS-California when a land or resource owner/manager requests assistance resolving a conflict with wildlife. WS-California personnel provide information, demonstrations, technical assistance, and advice on available and effective IWDM techniques. Technical assistance may include demonstrations on the proper use of management devices and information and advice on animal husbandry practices, techniques to modify human behavior, habitat management techniques, and animal behavior modification devices. Deciding which recommendations to suggest to a requestor requires substantial deliberation by WS-California. Part of the decision-making process includes an on-site visit or consultation with the requestor, which may include health and safety procedures for site-specific hazards. Generally, several short and long-term management strategies are described and recommended. Because the requestor is primarily responsible for implementing these strategies, the recommendations are based on the abilities of the requestor, the level of risk, need, and practical application. Compliance with applicable federal, state, and local laws and regulations is the responsibility of the landowner/resource owner when self-implementing the methods described as part of technical assistance.

2.1 Modification of Human Behavior

Modification of human behavior may be recommended to prevent and resolve conflicts between humans and wildlife. For example, WS-California recommends the elimination of both inadvertent feeding (i.e., improper disposal of garbage/storage of camp food, outdoor pet feeding, and feeding of cat colonies) and intentional feeding of wildlife by members of the public. Peri-domestic wildlife species (such as raccoons and striped skunks) adapt well to living near humans, and studies have shown increased density of mesocarnivore species along the urbanization gradient in part due to the capitalization of anthropogenic food sources (Salek et al. 2015). Unnatural densities of these species in proximity to conservation lands may result in damage to threatened and endangered (T&E) species. Even with considerable effort from land managers, it can be difficult to consistently enforce no-feeding regulations and to effectively educate all people concerning the potential liabilities of feeding wildlife. Other examples of modifying human behavior could include altering activity periods and walking in groups.

2.2 Habitat Modification

Habitat modification can be an integral part of WDM. Wildlife production and/or presence are often directly related to the type, quality, and quantity of suitable habitat.). While WS-California may recommend or be consulted on the types of habitat modifications that could be implemented to lessen or avoid damage, in all cases, the property owner would be responsible for evaluating and implementing habitat modifications.

2.3 Animal Husbandry Modification

Animal husbandry modifications include the level of livestock handling and care, shifts in the timing of breeding and births, changes in herding techniques, livestock species selection, and the use of human or animal guards (e.g., dogs, donkeys, and llamas) to protect livestock.

The level of care or attention given to livestock may range from daily to seasonal. Generally, as the frequency and intensity of livestock handling increases, so does the degree of protection. The risk of depredation is greatest in operations where livestock are left unattended for extended periods. This risk can be reduced when operations permit nightly gathering so that livestock are inaccessible during the hours when predators are most active. This risk diminishes as age and size increase and can be further minimized by holding expectant females in pens or sheds to protect births and by holding newborn livestock in pens for the first two weeks. Shifts in breeding schedules can also reduce the risk of depredation by altering the timing of births to coincide with the greatest availability of natural prey to predators or to avoid seasonal concentrations of migrating predators (such as golden eagles).

The use of human custodians and guarding animals can also provide significant protection in some instances. The presence of herders to accompany bands of sheep on an open range may help ward off predators. Guard dogs have also proven successful in many sheep and goat operations. The supply of proven guarding dogs is generally quite limited, and typically requires that people purchase and rear a pup. Therefore, there is usually a four- to eight-month period of time necessary to raise a guarding dog before it becomes an effective deterrent to predators. Because 25 to 30 percent of dogs are not successful even after training, there is a reasonable chance that the first dog raised as a protector will not be effective. Furthermore, the effectiveness of guarding dogs may not be sufficient in areas where there is a high density of predators, where livestock widely scatter to forage, or where dog-to-livestock ratios are less than recommended.

Altering animal husbandry to reduce wildlife damage can also be effective, although it has many limitations. For example, nightly gathering may not be possible where livestock are in many fenced pastures and where grazing conditions require livestock to scatter. Hiring extra herders, building secure holding pens, and adjusting the timing of births can be prohibitively expensive. Furthermore, the costs associated with a change in husbandry practices can often exceed any potential savings because the timing of births is often managed to coincide with weather patterns or seasonal marketing of young livestock.

2.3.1 Physical Exclusion

Physical exclusion refers to the separation of damage-causing wildlife from the resource to be protected and is considered one of the earliest forms of WDM.

Barrier fencing is typically used to prevent access to areas containing infrastructure (including road structures and bridges) and valued property such as gardens, fishponds, trees, orchards, dwellings, livestock or poultry pens, and T&E species. Selection of a barrier system depends on the wildlife species being excluded, expected duration of damage, size of the area or facility to be excluded, compatibility of the barrier with other operations (e.g., feeding, cleaning, harvesting, recreational activity, etc.), possible damage from severe weather, and effect on site aesthetics. The barrier system also depends on the resource being protected and its value. Systems can range from relatively simple systems such as metal flashing and hardware cloth to highly complex mesh and grid systems and electric fencing. Barrier systems can initially be very costly to erect and expensive to maintain, but can provide a long-term, highly effective solution to some damage problems.

Electric fencing could be used to alleviate damage caused by wildlife. The application of electrified fencing would generally be limited to site specific application where predation is occurring in a very limited geographic scale. Limits of this application arise where there are multiple landowners along a wetland, pond, or lake, the size of the area is relatively large, or where the area is in proximity to bodies of water. Predator control through judicious use and placement of electric fences and other barriers, as well as by trapping efforts, have reduced losses of adults, eggs, and/or young (USFWS 1985). While electric fencing may be effective in repelling predators in some urban settings, its use is often prohibited in many municipalities for human safety reasons. Problems that typically reduce the effectiveness of electric fences include vegetation on fence, flight capable birds, fencing knocked down by other animals (e.g., deer and dogs), and poor or intermittent power sources.

Tree protectors and sheathing can consist of wrapping hardware cloth, solid metal flashing, or other materials around the trunk of the tree, and are used to protect trees from beavers by physically preventing the semi-aquatic animal from causing damage. Sheathing or tree protectors could also be used in some situations to prevent access to trees canopies to protect nesting birds from predators. However, sheathing may be impractical where there are numerous plants or trees to protect, so it is mostly used in urban settings where only a few trees or objects need protection.

Netting can be useful in preventing birds from accessing resources or forming large roosts that could cause a risk to human health and safety and/or decrease aesthetics. For instance, the ceiling of parking garages can be netted to prevent pigeons and other birds from roosting above cars and dropping debris and feces on cars and people. Netting can be installed in hangers to exclude birds from perching or nesting indoors. Netting can be very successful if done correctly but it can be expensive and requires routine maintenance. Netting is also not practical over large areas.

Overhead wire grids can deter birds from using specific areas where they are causing a nuisance (Johnson 1994). The wires represent an obstacle that is difficult for a flying bird to see/navigate and make the area less attractive to birds. Overhead wire grids are more practical and cost effective than netting for large areas; for example, they can be used to keep some waterfowl out of retention ponds on airfields.

Perch inhibitors can be used to keep birds from perching on sensitive equipment and interfering with function. Perch inhibitors can be anything that render the perching area unusable to birds: zip ties, bird spikes, thin wire strung over the perch, golf tees, etc.

Chemical applications/tactile/taste repellents are materials that are rough and can discourage, reduce, or prevent the gnawing behavior of rodents, tacky or sticky substances to prevent perching, or non-hazardous chemical compounds designed to cause pain or discomfort. Abrasives produce an unpalatable surface which irritates the teeth and mouth of rodents when they attempt to gnaw or chew on the surface. Flexible materials, such as sandpaper, grinder pads, and fine-mesh stainless steel screening can be placed on or over objects (e.g., electrical wiring, plastic piping, fruit trees, etc.) that are susceptible to gnawing rodents. Fine sand can be added and mixed

with paint, glue, or other suitable liquid adherents to formulate a paste or heavy mixture that can be brushed-on or applied to a surface to discourage rodent gnawing. This method has had limited success when applied or painted on tree trunks to discourage beaver from cutting down trees. Abrasives are most practical where only a few trees or areas need protection. Primary repellents exemplified by tacky or sticky substances to prevent perching, or chemical compounds designed to affect pain or discomfort, evoke a limb withdraw or escape behavior (Clark and Avery 2013). Taste repellents such as methyl anthranilate and activated charcoal have shown to deter geese from grazing and repel passerines in laboratory feeding trials (Mason and Clark 1992).

Surface coverings could be used to provide hides for T&E species and decrease the success rate of predator detection. For example, clay roof tiles have been placed within California least tern colonies to act as chick shelters (USFWS 2006).

2.3.2 Harassment and Deterrent Methods

Harassment and deterrent devices rely on the use of sound, lights, pursuit, or other methods to frighten and disperse animals from the area to be protected. The success of frightening methods depends on animals' fear of, and subsequent aversion to, offensive stimuli. Once animals become habituated to a stimulus, they often resume their damaging activities. Considerable effort is usually required to consistently apply frightening techniques and then vary them sufficiently to prolong their effectiveness. Over time, some animals learn to ignore commonly used frightening methods that are no longer perceived as threats. In many cases animals frightened from one location become a problem at another.

Distress/predator calls are electronic devices that mimic sounds exhibited when target species are in distress, which is intended to cause a flight response and disperse target animals from the area. This technique is primarily used for avian management. Alarm calls are given by birds when they detect predators, while distress calls are given by birds when they are captured by a predator (Seamans and Gosser 2016). When other birds hear these calls, they believe a predator is present or a bird has been captured (Seamans and Gosser 2016).

Propane exploders/cannons produce noise that is intended to represent a firearm discharge. They are attached to a propane tank and regulated to discharge at certain intervals. Propane cannons work best when the interval of the discharge is random, the cannons are moved regularly, and they are combined with other methods, such as effigies. Although a propane exploder can be an effective dispersal tool for birds in agricultural settings, resident waterfowl in urban areas are more tolerant of noise and habituate to propane exploders relatively quickly.

Pyrotechnics are best described as controlled fireworks and can be safely used in a number of situations involving birds (USDA 2010). Pyrotechnics include, but are not limited to screamers, bird bombs, CAPA cartridges, and 12-gauge cracker shells. 12-gauge cracker shells are shotgun shells containing an explosive round that is projected up to 200 feet in the air before exploding. Bird bombs and screamers are fired from 6 mm starter pistols; they are used similarly to 12-gauge cracker shells, but they travel a shorter distance. For example, bird bombs travel approximately 75-100 feet before exploding. Screamers are similar to bird bombs, but they whistle in flight, leave a small trail of smoke in their wake, and do not explode. CAPA cartridges are fired from an 18.6 mm launcher and travel approximately 1,000 feet and explode generating a sound of approximately 150 dB at 32 feet.

As with frightening devices and propane exploders, the effects of pyrotechnics on nontarget wildlife need to be considered. For example, special-status birds or birds protected under the Migratory Bird Treaty Act (MBTA) may be disturbed or frightened from nesting sites.

Paintball guns are used as a non-lethal harassment method to disperse wildlife from areas using physical harassment. Paintballs are occasionally used to harass species such as waterfowl, raptors, and doves and to remove swallow nests. Paintballs can be used to produce negative physical and visual stimuli that can aid in the dispersal of birds from areas where conflicts or threats of conflict are occurring. WS-California uses washable, clear paintballs unless otherwise directed by the state or federal wildlife agency with jurisdiction over the lands where this method is used.

Water spray can be used to harass or disperse wildlife. It can be used to produce negative visual and physical stimuli to disperse birds such as swallows from areas where conflicts or potential conflicts are occurring. High pressure water spray is also used to remove swallow nests from areas where conflict is occurring. Work involving the removal of active nests is always performed under a depredation permit. Motion triggered sprinklers can also be used to deter deer and birds from damaging landscaping and smaller plantings.

Lasers and lights are used with mixed results to frighten wildlife. Lights can be used to flush avian predators off hunting perches. However, most animals rapidly become accustomed to such lights and their long-term effectiveness is questionable. Lasers have shown some effectiveness with waterfowl, wading birds, gulls, vultures, and crows (USDA 2003). Lasers have a narrow, targeted beam which are used to depict a novel object approaching the bird that elicits a flight response. Best results are achieved under low-light conditions (i.e., sunset through dawn) and targeting structures or trees proximate to roosting birds, thereby reflecting the beam (USDA 2003; Blackwell et al. 2002).

Scarecrows and effigies often depict predator animals (e.g., alligators, owls), people, or mimic distressed target species (e.g., dead ravens, dead crows) and they are intended to elicit a flight response from target birds, which disperses those birds from the area. Avery et al. (2008) found that effigies could be effective at dispersing crows. When crow aggregations are relatively small, then effigies might suffice, but for large roosts it is likely that reinforcement with additional methods such as pyrotechnics or distress calls will be needed (Avery et al. 2008). Crow or raven effigies are mainly used to protect nesting colonies or individual nests from avian predators. In general, scarecrows would be most effective when they are moved frequently, alternated with other methods, and are well maintained. Scarecrows tend to lose effectiveness over time and become less effective as populations of target species increase (Smith 1999), though they have been used effectively to deter raptors from establishing nests on certain power structures by mimicking utility staff accessing the tower.

Eye-spot balloons and mylar strips and balloons provide visual harassment for wildlife. Eye-spot balloons have large eyes that are intended to give birds a visual cue that a large predator is present. Mylar® tape and flags can also be used to deter birds from certain areas. These materials produce sound and flashes in the sun when wind blows over it that may frighten some species.

Radio-controlled vehicles can be used to haze wildlife from undesirable areas. Radio-controlled boats, cars, and drones can be used to move wildlife off ponds, saturated areas, and areas that are otherwise impassible. These tools are used to provide wildlife a visual stimulus to leave the area and not used to make (physical) contact with wildlife.

Vehicles can be used to pursue animals as a form of harassment. The purpose is to approach the animals with a large object, sometimes with lights flashing and a siren, to scare the birds away from an area. This technique is often used in airports. The vehicle is never used to run over or injure the animal.

Tactile repellent products reportedly deter birds from roosting on certain structural surfaces. Commercially available products such as polybutene present a tacky or sticky surface that the birds avoid. Different formulations,

both liquid and gel, may be appropriate for many different situations, such as trees, shrubbery, ledges, beams, windowsills, gutters, cornices, roof lines (perimeters), and air conditioners (Zemsky 1995). The substance does lose its tackiness after approximately one year; moreover, the old material would need to be removed and new material reapplied (Zemsky 1995).

Olfactory repellents are used to deter animals from using specific areas for shelter or feeding. These commercially available products contain strong herbal odors. This smell encourages the sheltering animal to vacate the specific location where applied.

Dogs have been used successfully to disperse birds, especially waterfowl in urban and suburban areas (Seamans and Gosser 2016). Properly trained dogs provide harassment that birds recognize as threats. As with any bird dispersal technique, dogs are more effective when used in combination with other methods, as birds may become habituated to dogs and may no longer react to their presence (Seamans and Gosser 2016).

3 Operational Assistance

The IWDM program uses specialized equipment (i.e., pyrotechnics, specialized traps, and federally licensed firearms) when field assistance is requested for the protection of resources by WS-California personnel. While some of these methods can either be recommended as technical assistance or be implemented directly by WS-California personnel, the cost and required expertise or training often preclude the use of many of these methods by outside agency personnel or private citizens not solely dedicated to wildlife conflict management.

3.1 Avian Methods

3.1.1 Physical Exclusion

Physical exclusion refers to the separation of damage causing wildlife from the resource to be protected and is considered one of the earliest forms of WDM. Examples of physical exclusion techniques include:

Netting – see description above in technical assistance.

Overhead wire grids – see description above in technical assistance.

Perch inhibitors – see description above in technical assistance.

Chemical applications/tactile/taste repellents – see description above in technical assistance.

Surface coverings – see description above in technical assistance.

One-way Door Excluders are devices usually used in urban settings to allow an animal to leave an area where it is unwanted by way of a one-way door or a narrowing exit that prevents them from re-entering through the same entrance. They can be used for small mammals, meso-mammals, bats, and some bird species. They are installed over a hole (usually in the side of a house or other building) with the door opening from the inside of the structure outside. Once the animal has exited the door serves as a barrier to re-entrance. Once it is ascertained that no more animals are in the structure, the landowner is usually advised to repair the hole.

3.1.2 Harassment and Deterrent Methods

Distress/predator calls – see description above in technical assistance.

Propane exploders/cannons – see description above in technical assistance.

Pyrotechnics – see description above in technical assistance.

Water spray – see description above in technical assistance.

Lasers – see description above in technical assistance.

Scarecrows and effigies – see description above in technical assistance.

Eye-spot balloons and mylar strips and balloons – see description above in technical assistance.

Radio-controlled vehicles – see description above in technical assistance.

Vehicles – see description above in technical assistance.

Tactile repellent products – see description above in technical assistance.

Olfactory repellents – see description above in technical assistance.

Dogs – see description above in technical assistance. Government-owned and employee-owned trained dogs will accompany the WS-California employee/handler on official duty only when there is an operational need. Dogs will not be allowed to intentionally kill animals. WS-California personnel's dogs are proficient in a specific set of skills necessary to perform functions in a manner that is responsive to its handler's commands.

Paintball guns – see description above in technical assistance.

3.1.3 Capture Methods

Live capture methods are used to capture individuals causing damage. Most of these methods involve the use of traps set to capture and hold the animal alive until personnel arrive. The animal can then be euthanized or released as appropriate. Some individuals are relocated with the approval of California Department of Fish and Wildlife (CDFW) and United States Fish and Wildlife Service (USFWS). Traps set by WS-California personnel are checked by WS-California personnel, the landowner/manager, or their designated agent.

Air cannon/rocket nets are typically used for larger birds, such as waterfowl and turkeys, and use compressed air to propel a net up over birds, which have been baited to a particular site. The habitat must be relatively flat, open, and void of vegetation that could become tangled in the net and allow for target species to escape.

Bow nets/E-Z catch nets are normally used to capture raptors, but may also be used for European starlings, shorebirds, and other species using visual bait and/or conspecific decoys. Bow nets are set on the ground and are remotely triggered from a nearby observation site. Once triggered, the net envelops the target birds. The captured bird is removed from the net as gently and quickly as possible to avoid entanglement and additional stress. WS-

California personnel positively identify the target species prior to deploying the trap. These nets are operated by a spring-loaded system with a net between two curved (bowed) rods. When used to capture raptors, a lure animal is placed at the center to attract the raptor to the trap. This method can also be elevated to increase success of capturing certain species. E-Z catch nets are similar to bow nets except that they have a treadle/trigger that is set off by the animal.

Drop nets are nets suspended over a pre-baited site and manually or remotely triggered to drop on target animals. Decoys (live and/or fake) may also be used to enhance the effectiveness of drop nets. Drop nets require specific knowledge of the targeted species' congregation locations and timing to be effective. WS-California personnel monitor the pre-baited site and when the target species is in the correct location under the nets, WS-California personnel activate the net from a nearby location and quickly secure the target wildlife to prevent escape.

Hand nets are used to catch birds in confined areas (e.g., buildings). WS-California occasionally uses hand nets for various WDM activities. Most hand nets resemble fishing dip nets with soft netting of various grids and diameters mounted on a long handle. A variation of the hand net is a round net with weights at the edges of the net. It is thrown and is like throw nets used for fishing. Hand nets are a species-specific, live-capture technique.

Mist nets are more commonly used for capturing small-sized birds but can be used to capture larger birds such as ducks and ring-necked pheasants or smaller hawks and owls. Mist nets are fine silk or nylon nets, usually black or tan in color, and range from 3 to 10 feet wide and 25 to 35 feet long. Net mesh size determines the species of birds that can be caught. They are strung between poles in locations where the target birds are known to travel (i.e., along a stream, across an opening in a wooded area) so that the nets form loose pockets. When the bird flies into the nets they are caught up in the pockets. Mist nets can also be used in doorways. Mist nets are monitored by personnel and birds are removed promptly.

Dho-gazza traps employ larger gauge mist nets that are strung between poles with a lure animal placed inside of the nets to attract the target species to the trap. The mist nets are set to breakaway and thus wrap the raptor up in the net. This trap is most often used to capture northern harriers.

Net guns/launchers use a firearm blank or compressed air to propel a weighted net up over birds, which have been baited to a particular site or habituated to the close proximity of human presence.Net guns are handheld and manually discharged while net launchers are ground based and remotely discharged from a nearby observation site.

Padded-jaw foot-hold traps altered for birds. (Full padded-jaw foot-hold description can be found in the Mammalian Methods section). Modified Padded-jaw foot-hold traps can be used for avian species. For avian species the factory supplied springs are weakened or replaced to decrease the amount of pressure, and either surgical tubing or foam is added for extra padding. These traps are placed where target birds have been observed perching on the ground. The trap is anchored so that the captured bird cannot leave the location.

Pole traps (Verbail or modified padded-jaw foot-hold traps) are traps on the top of a pole and are primarily used to capture raptors. "Pole traps are live traps that can be effective and humane tools for alleviating certain problems caused by raptors" (USFWS 2005). Depending on the species being trapped, the modified padded-jaw foot-hold trap size, pole height, trap placement, and trap location are all taken into consideration by APHIS-WS personnel prior to setting. The padded-jaw foot-hold trap is highly modified with the original springs either replaced or weakened in addition to having off-set jaws, and either surgical tubing or foam rubber securely attached to the already rubberized jaw for extra padding. Traps are attached to a guide rod or thick wire that runs from the trap

down the pole to the ground. Once an animal is captured, the trap and raptor slide down the guide to the ground for handling. A Verbail trap consists of a platform or stand wrapped with a nylon cord and associated steel spring placed on top of a pole. When tripped, the cord wraps around the bird's foot and holds it. The steel spring is attached to a guide wire which allows the trap to slide down the pole to the ground.

Bal-chatri traps (BC traps) consist of a small wire cage with monofilament nooses attached to the top and sides of the trap. The monofilament test line (ranging from 8.25-pound test fishing line) and noose size will vary depending on the size of the target species. The trap is baited with a mouse and/or other live bait depending on the size of the target species; the lure animals are protected inside the trap from the target species. Cages are generally constructed of ½ inch wire hardware cloth and may be 2-3 inches tall and 10-14 inches square. A 2-4 pound weight (such as large fishing weights or bench press weights) are attached to the trap to prevent the raptor from moving the trap once it is caught. These traps would be deployed in the line of sight of the target raptor and would be constantly monitored by WS-California personnel.

Phai hoop traps have a circular shape and have many upright nooses placed all along its circumference. A lure animal is placed in the center of the hoop. The trap is deployed within sight of a raptor, similar to a BC trap. As the raptor extends its legs to grab the lure, it becomes ensnared by the hoop's nooses.

Pigeon harnesses are a piece of leather or heavy material that fits onto lure bird such as a pigeon or starling like a backpack and allows the lure bird its full range of motion. Heavy weight monofilament line tied into sliding nooses are attached to the backpack and a ground anchor or weight is attached to secure everything to the ground. The pigeon harness is deployed similarly to the BC trap and the nooses that are attached to the harness catch on the targeted raptor's talons, toes and/or feet. This method is effective at capturing peregrine falcons; it is constantly monitored and only used when a target raptor is present.

Funnel traps are used to live-capture waterfowl. The traps can vary in size and are usually constructed of netting or wire mesh. Traps are set up in shallow water and baited; they allow waterfowl to enter the trap but prevent them from exiting. Traps would be checked regularly to address live-captured waterfowl.

Nest box traps are effective in capturing cavity nesting birds, such as European starlings, and operate similar to other live-capture traps. Nest box traps allow birds to enter a nest box, but not exit.

Nest/walk-in traps are similar to box or decoy traps. They are placed over an active nest or baited with food and allow the target bird to pass through a funnel, one-way, or drop-down door that confines the target. Nest and walk-in traps are effective in capturing ground nesting birds such as cormorants, ducks, geese, and ground feeding birds such as rock pigeons and mourning doves.

Swedish goshawk traps are compartment-style traps with a lower bait cage that houses a lure animal. The upper compartment is a trapping mechanism that consists of an "A" frame made of wood or metal along with a trigger that is mounted atop the bait cage. The side panels are generally made of mesh wire or netting. The sides of the "A" are hinged so that the sides are held open in a "H" shape by a trigger that stretches the length of the trap. The trigger mechanism is hinged in the middle. As a raptor enters the trapping mechanism to investigate the lure in the bait trap, it lands on or brushes against the trigger, which collapses and allows the sides to close back into an "A" shape trapping the raptor inside (Meng 1971; Kenward et al. 1983). The doors are held closed by springs. The bait cage can hold multiple lure animals to increase movement and/or visibility of the trap. Lure animals are provided with food and water while in the bait cage.

Cage traps are non-lethal capture devices. The size of the cage trap depends on the size of the targeted species; this helps limit the capture of non-target species by physically excluding them from the trap. Traps are set near signs of damage or in areas where the target species is known to travel and are usually baited with species-specific baits. Cage traps set by WS-California personnel are checked daily. Cage traps are typically set with a bait or lure to encourage the target species to enter the trap. Baits can be chosen to be selective for target species. A trigger mechanism usually located at the back of the trap is triggered by the animal and the trap closes. The animal is enclosed in the trap and held until it is subsequently released or euthanized. Because the animal is held alive, if a non-target animal is captured, it can usually be released unharmed.

Box traps are similar to cage traps. They are rectangular in shape and either have a door that is triggered when an animal steps on a treadle or is a one-way door. The trap is baited with a food item that encourages the animal to walk through the door or the bait is placed in the expected path of the animal to lure it towards the trap.

Decoy traps are similar in design to the Australian Crow Trap as reported by McCracken (1972) and Johnson and Glahn (1994). Decoy traps are commonly rectangular, and they are generally constructed of a wooden or metal frame and wire mesh or netting to form an enclosure, which can be constructed in a variety of sizes, depending on the target species and the number of birds likely to be captured. Sides go up above the middle panel with the funnels and have perches to encourage birds to stay above the funnels, so they do not try to escape. Decoy traps are commonly used by WS-California to target social flocking bird species such as crows, starlings, house sparrows and blackbirds. Live decoy birds of the same species being targeted are usually placed in the trap with sufficient food and water to assure their survival. Perches are configured in the trap to allow birds to roost above the ground and in a more natural position. The feeding behavior and calls of the decoy birds attract other target birds to the trap. In addition, the traps are often baited with food attractants. Openings in the enclosure allow target birds to enter the enclosure to feed on the bait. Openings are generally placed at the top of the enclosure and are generally about the length and width of target bird species with their wings folded so birds can enter but are unable to exit with their wings extended as they are flying upwards toward the openings. Active decoy traps are monitored daily to address captured birds and to replenish bait and water. Depending on design, decoy traps can be portable or permanent. Portable decoy traps generally consist of several parts and panels that require assembly once transported to a location where target animals are active.

Corral traps could be used to live-capture birds, especially waterfowl. Corral traps can be effectively used to live-capture waterfowl during the annual molt when birds are unable to fly. Each year for a few weeks in the summer, waterfowl are flightless as they are growing new flight feathers. This method consists of setting up an enclosure with an open end consisting of several movable panels. The birds are then surrounded by personnel and slowly guided into the corral trap and the panels are closed behind them. This method is labor intensive and requires multiple individuals to participate in the drive.

3.1.4 Lethal Methods

Water spray – see description above in avian harassment and deterrent methods. This method can be lethal to chicks and eggs when used on active nests. A MBTA depredation permit is required to use this method on active nests.

Shooting. Licensed firearms are used to selectively remove individual target animals. Shooting is a very targeted method, and a properly placed gunshot can cause immediate insensibility and a humane death (AVMA 2020). When needed, WS-California personnel kill animals as quickly and humanely as possible; under some conditions a gunshot may be the only practical method of euthanasia (AVMA 2020). All applicable firearm safety precautions, laws, and

regulations governing the use of firearms are followed by WS-California when conducting IWDM activities. To ensure WS-California employees receive uniform firearms safety training, National Rifle Association (NRA) certified instructors and the NRA's curriculum for the basic pistol, rifle, and shotgun certifications are the officially recognized program for initial WS-California firearms safety training. WS-California personnel periodically receive updated training per the WS Firearms Safety Training Manual. More detailed information on WS-California firearm use, training, and storage can be found in WS Directive 2.615: WS Firearm Use and Safety (USDA 2020). WS-California personnel commonly use firearms in combination with other techniques and/or modifications listed below.

- *Calling* consists of using voice, mouth, handheld, or electronic calls to draw predators into the area. Calling is often used to draw the target species into firearm range.
- *Night shooting* may be conducted with spotlights or night vision devices. Night vision devices are undetectable to the surrounding environment. Spotlights are high intensity lights that are used to identify and cause the target species to temporarily pause its movements and/or flush when exposed for a length of time.
- *Non-lead (non-toxic) ammunition*. Effective July 1, 2015, California state law (AB711) and subsequent regulations promulgated by the California Fish and Game Commission require the use of nonlead ammunition in a phased approach when taking wildlife for recreation or depredation purposes. Effective July 1, 2019, nonlead ammunition is required for the taking of any wildlife for any reason. WS-California has made a transition to using nonlead ammunition when controlling wildlife. Nonlead ammunition will be used whenever feasible when taking wildlife. However, WS-California may use lead ammunition in cases of public safety or in certain situations for employee safety (e.g., in cases of tight spaces; lead ammunition may be used to reduce potential for ricochet) per WS Directive 2.210. In these cases, personnel remove the carcass of the animal and contained lead from the environment. More information on the regulations and phased approach can be found at https://www.wildlife.ca.gov/Hunting/Nonlead-Ammunition.
- *Suppressors.* Firearms create high intensity sound for short durations. When possible, and without reducing the effectiveness of the methods, WS-California uses suppressors (silencers) and specific ammunition (subsonic) to minimize the audio report of firearms. Suppressors and subsonic ammunition are most often used with rifles. Shotguns cannot always be suppressed without affecting shot pattern and/or shooting accuracy.

Carbon dioxide (CO2) is sometimes used to euthanize birds that are captured in live traps. Live birds are placed in a container, such as a plastic 5-gallon bucket, or chamber that is then sealed shut. Carbon dioxide gas is released into the bucket or chamber and birds quickly die after inhaling the gas. This method is approved as a euthanizing agent by the American Veterinary Medical Association (AVMA) (AVMA 2013). Carbon dioxide gas is a byproduct of animal respiration, is common in the atmosphere, and is required by plants for photosynthesis. It is used to carbonate beverages for human consumption and is the gas released by dry ice. Therefore, the use of carbon dioxide by WS-California for euthanasia purposes is exceedingly minor and inconsequential to the amounts used for other purposes or generated by other human activities.

DRC-1339 is a slow acting avicide that is registered with the U.S. Environmental Protection Agency (EPA) for use on a number of bird species (e.g., ravens, crows, pigeons, gulls, blackbirds, and European starlings), and on various bait carriers, such as grain, meat baits, eggs, sandwich bread, and French fries. DRC-1339 is only available for use in California under WS-California supervision. DRC-1339 was developed as an avicide because of its differential toxicity to mammals. DRC-1339 is highly toxic to sensitive bird species but only slightly toxic to non-sensitive birds, predatory birds, and mammals. Most bird species that are responsible for damage, including but not limited to starlings, blackbirds, pigeons, crows, magpies, and ravens, are highly sensitive to DRC-1339. Many other bird

species such as raptors (Schafer 1981), sparrows, and eagles are classified as non-sensitive. Secondary poisoning has not been observed with baits treated with DRC-1339. Numerous studies show that DRC-1339 poses minimal risk of primary poisoning to non-target species and T&E species (EPA 1995). This can be attributed to relatively low toxicity to species that might scavenge on birds killed by DRC-1339 and DRC-1339's tendency to be almost completely metabolized in the target birds, which leaves little residue to be ingested by scavengers. Secondary hazards of DRC-1339 are almost non-existent. DRC-1339 acts in a humane manner, producing a quiet and apparently painless death.

DRC-1339 is unstable in the environment and degrades rapidly when exposed to sunlight, heat, or ultraviolet radiation. The half-life is about 25 hours, which means it is nearly 100% broken down within a week, and identified metabolites (i.e., degradation chemicals) have low toxicity. DRC-1339 is highly soluble in water, but does not hydrolyze, and degradation occurs rapidly in water. DRC-1339 tightly binds to soil and has low mobility.

Studies continue to document the effectiveness of DRC-1339 in resolving blackbird/starling problems at feedlots (e.g., West and Besser 1976) and dispersing crow roosts in urban/suburban areas (e.g., Boyd and Hall 1987). Glahn and Wilson (1992) noted that grain baiting with DRC-1339 is a cost-effective method of reducing conflicts with blackbirds and sprouting rice.

Active nest destruction is a dispersal technique used to encourage adult birds to leave the area after their nests and eggs are destroyed. In addition to dispersing birds, this method may also reduce the aggressive nature of adult birds during the nesting period. For birds protected under the MBTA, the USFWS permits "active nest destruction" only under the issuance of a depredation permit. This control method is target-specific, with very little chance for the take of non-target species.

Egg addling/oiling are methods of suppressing reproduction in local predating bird populations by destroying egg embryos prior to hatching. Egg addling is conducted by vigorously shaking an egg numerous times, which causes detachment of the embryo from the egg sac. Egg oiling is a method for suppressing reproduction of predating birds by placing a small quantity of food grade corn oil on eggs in nests. The oil prevents exchange of gases and causes asphyxiation of developing embryos and has been found to be 96-100% effective in reducing hatchability (Pochop, Cummings, Steuber et al. 1998; Pochop, Cummings, Yoder et al. 1998). The EPA has ruled that use of corn oil for this purpose is exempt from registration requirements under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). To be most effective, the oil should be applied anytime between the fifth day after the laying of the last egg in a nest and at least five days before anticipated hatching. Egg addling and oiling is different than nest destruction in that the incubating birds generally continue incubation and do not re-nest. Egg addling and oiling are only done after positive identification of the nesting species, as such this method is extremely target specific and poses no threat to non-target species.

Snap traps are common household rat or mouse traps usually placed inside structures. Modified snap traps can be used to remove individual European starlings and other cavity nesting birds. These traps are sometimes used to target species-specific offenders entering small cracks where other types of traps will not fit. The trap treadle is placed near the damaged area caused by the offending bird. Positive species identification and monitoring of species activity around the entry point limit the take of non-target species.

Physical Euthanasia methods include shooting, cervical dislocation, decapitation, and stunning. When properly used by skilled personnel, AVMA states that physical methods of euthanasia may result in less fear and anxiety and be more rapid, painless, humane, and practical than other forms of euthanasia. Shooting may be the quickest and only method available under most field conditions. Manual euthanasia methods may be used to euthanize small

birds, rodents and reptiles in limited circumstances as acceptable to AVMA. All euthanasia methods should be performed discretely by properly trained personnel to minimize stress to the animal (AVMA 2020).

3.2 Mammalian Species Methods

3.2.1 Physical Exclusion

Physical exclusion refers to the separation of damage causing wildlife from the resource to be protected and is considered one of the earliest forms of WDM.

Barrier fencing – see description in technical assistance.

Electric fencing – see description in technical assistance.

Tree protectors and sheathing – see description in technical assistance.

Chemical applications/tactile/taste repellents – see description above in technical assistance.

Surface coverings – see description above in technical assistance.

One-way Door Excluders – see description in avian physical exclusion.

3.2.2 Harassment and Deterrent Methods

Pyrotechnics – see description above in technical assistance.

Water spray – see description above in technical assistance.

Lasers – see description above in technical assistance.

Scarecrows and effigies – see description above in technical assistance.

Eye-spot balloons and mylar strips and balloons – see description above in technical assistance.

Vehicles – see description above in technical assistance.

Dogs – see description above in avian harassment and deterrent methods.

Rubber bullets/beanbag rounds may be used to harass or disperse wildlife causing damage or wildlife in proximity to people. This hazing may resolve or prevent human/wildlife interaction.

Fladry/Turbo fladry may be used to discourage deter wolves from entering an area. Fladry is a single strand of polyline with flagging attached (Young et al. 2015). Turbo fladry is electrified as in an electric fence. The key to fladry is that it is most effective when it is installed to be highly visible (UCCE 2019). Since turbo fladry is electrified, it tends to be effective longer (Lance et al. 2010); for example, when a wolf tests the fladry it is shocked. WS-California both recommends turbo fladry and sometimes assists landowners with the installation of turbo fladry. Fladry and turbo fladry are temporary alterations to habitat. Turbo fladry may provide livestock owners' temporary

relief (Davidson-Nelson and Gehring 2010) and is probably only effective for a timeframe measured in months (UCCE 2019). It is recommended that once livestock are moved or wolf activity at the site decreases, that the turbo fladry be removed.

3.2.3 Capture Methods

Box traps – see description above in avian methods.

Net guns/launchers – see description above in avian methods.

Hand nets – see description above in avian methods.

Cage traps see additional description above in avian methods. Cage traps used to capture mountain lions are typically constructed of commercial livestock panels made of 3/16-inch galvanized welded rods. The top, sides, front, and bottom panels are welded together, and panel openings are approximately 2-inch x 4-inch. These cage traps may have a treadle-type trigger or trip line and a single-catch, multi-catch, or gravity door.

Large cage traps are occasionally used by WS-California to capture bobcats and feral dogs. WS-California defines large cage traps as being larger than 12-inch x12-inch x 36-inch, but they do not include culvert traps (see below). Large cage traps vary in size and shape depending on the species being targeted. Bobcat or dog-size cage traps are made of welded wire, utilize a treadle-type trigger or trip line system and close with a spring or gravity door.

Cage traps measuring 12-inch x12-inch x 32-inch and smaller are typically used by WS-California for capturing animals the size of raccoon and smaller. They are often set in urban areas to capture meso-mammals such as raccoons and skunks that are causing damage. While many cage traps are welded wire style traps, some small cage traps are constructed from a tube or a plastic box. The trap functions in a similar way to the more common welded wire style traps.

Clover traps are a type of box trap used to capture deer. They measure approximately 4 feet (height) x 3 feet (width) x 6 feet (length) and are comprised of metal tubing frame covered with a heavy netting. Bait is put at the back of the trap behind a trigger line. When the animal trips the string, the door is released and closes. Some modified designs allow the trap to be collapsed by handlers when the deer is captured to facilitate restraint of the deer and minimize struggling.

Culvert traps are a type of trap constructed of solid material as opposed to welded wire or livestock panels used in large cage traps. They have differing trigger systems but usually utilize swing doors and are often on a wheeled platform or trailer for transport. WS-California often uses this type of trap when dealing with black bears that are in urban/suburban settings, although they can also be used in rural areas and for other species. Due to the size and weight of most culvert traps, they are primarily restricted to use near roadways, although models exist that may be disassembled and reconstructed in remote areas. The type of bait used depends on the nature of the damage problem and target species. WS-California implements a daily trap check for all culvert traps. Non-target animals are generally released uninjured, and target animals are usually euthanized or relocated as appropriate and when authorized by the CDFW.

Corral traps are used to live-capture mammals, primarily feral swine. Corral traps are circular pens 3 to 10 meters in diameter and constructed of panels or cattle fencing, which can be interconnected to expand or contract the size

of the corral. Corral traps used by WS-CA employ a lift up or side swing head gate or drop-down net to allow access for the feral swine to enter.

Pig brig traps are a circular trap of netting supported by t-posts. After a period of time during which the net is suspended above the ground so that pigs can go in and out of the area and eat bait, a net skirt is attached to earth anchors on the inside of the trap. Pigs are still able to nose their way under the skirt and into the trap, however they are prevented from exiting. This trap allows for multiple captures of animals.

Snares made of wire or cables are among the oldest wildlife management tools and are generally not affected by inclement weather. They can be used effectively to catch most species. Snares may be employed as either lethal or live-capture devices depending on how or where they are set. Most snares are also equipped with a swivel to minimize injuries to the captured animal and reduce twisting and breakage of the snare cable. Breakaway devices can also be incorporated into snares, allowing the loop to break open and release the animal when a specific amount of force is applied. These devices can improve the selectivity of cable restraints to reduce capture of non-target species. Common types of snares include:

- Neck snares are set to capture an animal by the neck and are usually lethal, but stops can be applied to the cable to make the snare a live-capture device. Snares positioned to capture the animal around the body can be useful live-capture devices. Snares can be effectively used wherever a target animal moves through a restricted lane of travel (i.e., "crawl holes" under fences, trails through vegetation, or den entrances). When an animal moves forward into the loop formed by the cable, the snare tightens, and the animal is held.
- Collarum™ is a non-lethal, spring-powered, modified neck snare device that is primarily used to capture coyotes. The trigger is designed specifically for canines, which use a distinct pulling motion to set off the device. The device uses an attractant and is activated when an animal bites and pulls a cap. The snare is then projected from the ground up and over the head of the coyote. A stop on the device limits loop closure and prevents capture of smaller non-target wildlife. As with other types of snares, the use of the Collarum™ device to capture coyotes is greatly dependent upon finding a location where they frequently travel.
- Foot snares are a spring-powered non-lethal device, activated when an animal places its foot on the trigger pan. In some situations, using hanging snares to capture wildlife is impractical due to the behavior or morphology of the animal, or the location of wildlife conflicts. Neck snares must be set in locations where the likelihood of capturing non-target animals is minimized, but foot snares with built-in pan tension devices can be set to exclude animals lighter than the target animal.
- Foot snares set for bear are usually set with the trigger in a vertical pipe, large enough for a bear's paw, buried vertically, so that the top is flush with the ground. The cable loop is placed around the circumference of the pipe, and bait is placed in the pipe, under the trigger. When the animal reaches into the pipe, it sets off the trigger and a cable loop is propelled onto the animal's leg.

Catch poles are handheld devices used to capture or safely handle animals. A catchpole is a hollow pipe with an internal cable or rope that forms an adjustable noose at one end. The free end of the cable or rope extends through a locking mechanism on the end opposite of the noose. By pulling on the free end of the cable or rope, the size of the noose is reduced sufficiently to hold an animal. For IWDM, catch poles are primarily used to capture animals partially restrained by barriers (i.e., a raccoon trapped in a building) or to remove live animals from traps without danger to or from the captured animal.

Suitcase or basket traps are designed to live-capture beaver. The traps are constructed of a metal frame hinged with springs and covered with chain-link fence. When set, the trap is opened to allow an animal to enter and when

tripped, the metal frame closes like a suitcase around the animal. These styles of traps are set in the shallows of waterways (i.e., ponds, rivers, creeks, lakes, etc.) near or on the shoreline or bank so that a captured beaver would always have access to air. They are not set underwater where a triggered trap would be totally submersed in water. Basket-type traps are live-capture traps checked daily by WS-California personnel, the landowner, or their designated agent. These traps are primarily used in rural or restricted access areas but can be set in urban areas if they do not present a hazard to pets (companion animals) or children.

E-zee set or gravity catch traps consist of a welded metal frame fitted with a front grate, wide mesh, and pressure trigger. These traps are set on or near beaver dams where water can flow through the grate. When a beaver brings material to plug the flowing water, the top of the trap is released and drops to surround the animal. These traps have no springs and are considered safer for public access areas.

Padded-jaw foot-hold traps are coil spring traps with rotating jaws. They have centrally attached inline shock springs, swivels to allow for movement, and are equipped with non-hardening rubber on the face of the jaw. These traps come in several sizes depending on the target species. Padded-jaw foot-hold traps are designed to close on an animal's foot and hold the animal without injuring it. They have adjustable pan tension triggers which allow the exclusion of animals smaller than the target species. These traps can be used for live-capture and release or hold for subsequent euthanasia. Padded-jaw foot-hold traps usually permit the release of non-target animals unharmed.

Padded foot-hold traps can only be used in California for the protection of public safety and of T&E species. (In *Nat. Audubon Society v. Davis* (N.D. Cal. 2000) 144 F. Supp. 2d 1160, the United States District Court for the Northern District of California held that Section 3003.1(c) of the California Fish and Game Code, which generally prohibits the use of any steel-jawed leghold trap except when necessary to protect human health or safety, did not apply to federal agencies engaged in wildlife management on federal lands or in conservation efforts under federal law, including the protection of T&E species.) Target animals may be euthanized, released on site, or relocated; non-target species may be released on site.

These traps are placed in the travel paths of target animals, and some are baited or scented, using an olfactory attractant, such as the species' preferred food, urine, or musk/gland oils. The use of baits also helps to facilitate the prompt capture of target predators. This often decreases the total time traps are in the field, thereby lowering risks to non-target animals. In some situations, a draw station—a carcass, or large piece of meat—is used to attract target animals. In this approach, one or more traps are placed in the vicinity of the draw station. WS Directive 2.450 prohibits the placement of traps closer than 30 feet to the draw station to reduce the risk to non-target animals (USDA 2020).

Padded-jaw foot-hold traps set for mountain lions, bobcats, coyotes, and feral dogs are set with dirt or debris (e.g., leaf litter or rotting wood) sifted on top. The traps can be staked to the ground securely, attached to a solid structure (such as a tree trunk or heavy fence post), or used with a drag that becomes entangled in brush to prevent the trapped animal from escaping. Anchoring systems should provide enough resistance that if a larger animal is unintentionally captured, it should be able to either pull free from the trap or be held to prevent escaping with the trap on its foot.

Effective trap placement also contributes to trap selectivity. To minimize risk of capturing non-target animals, the user must be experienced and consider the target species' behavior, habitat, environmental condition, and the habitats of non-target animals. The pan tension, type of set, and attractant used greatly influence both capture efficiency and risks of catching non-target animals. The level of trap success is often determined by the ability of the user, through training, skill, and experience, to adapt the trap's use for specific conditions and species. WS-

California personnel check these traps daily and follow state laws and regulations regarding the setting and checking of traps and snares per WS Directive 2.450 and 2.210 (USDA 2020).

Trained dogs/hounds are used to trail certain species, identify sites to set equipment where target wildlife might be travelling, to tree specific species of wildlife for capture or removal, and as a decoy to draw target species closer for shooting activities.

- ***Decoy dogs*** are sometimes used to lure coyotes within shooting distance. These dogs are kept under control of personnel and are unlikely to interact with wildlife.
- ***Detection dogs*** are used to identify sites where equipment may be effective by indicating where mountain lions, bears, coyotes, or other predators have traveled, urinated, or defecated. They are kept under the control of personnel and are unlikely to interact directly with wildlife.
- ***Trailing dogs*** are used by WS-California to trail mountain lions, bobcat, feral swine, and black bears. Dogs are trained to find and follow the scent of the target species. The dogs are tracked with GPS collars and stay with the animal until WS-California personnel arrive and then anesthetize, dispatch, or release it, depending on the situation. For instance, WS-California personnel assist CDFW with research by collaring mountain lions and bobcat with new radio telemetry collars, replacing old collars, and monitoring collared mountain lions using dogs. Dogs are trained to ignore the scents of non-target species.

Telemetry is the monitoring of radio signals sent from a device attached to an animal to monitor an animal's movements or location. The attachment of the transmitter requires the capture and either chemical or physical restraint of the individual. The transmitter is usually a collar (in the case of mammals) or a backpack (in the case of birds). Personnel monitor the receiver on foot, in a ground vehicle, or in an aircraft.

Chemical immobilization is the use of drugs such as telazol (a combination of tiletamine and zolazepam) and ketamine/xylazine to restrain wildlife to allow for activities such as collaring and sample collection. This process can be dangerous both for personnel and the animal and requires training and experience.

These immobilizing agents produce central nervous depression through various means and render the animal unconscious. They are delivered to the target animal with a dart gun, blow gun, or syringe pole depending on the circumstances and the species being immobilized. If the agents are delivered via a dart, the dart is retrieved if possible. Often, the animal is typically treed with dogs or physically restrained by a trap and then the drug is delivered to the animal.

Once the procedures are completed the animal is monitored until it has recovered. For some of the immobilizing drugs, this means allowing the drugs to work through the animal's system. For others, there are antagonists that can be given that reverse the effects of the immobilizing drug such as yohimbine for xylazine.

3.2.4 Lethal Methods

Lethal methods are often most appropriately used by trained and certified WS-California personnel. Licensed firearms are often used in conjunction with non-lethal methods to attract the animal to an area or to capture the animal and hold it until personnel arrive. Methods used to attract or capture predators prior to lethal removal by firearm include calling, trained dogs, cage traps, foot/leg snares, and padded-jaw foot-hold traps. In addition, WS-California uses other lethal methods such as body-grip traps to remove wildlife that is causing damage.

Shooting – see description above in avian methods.

Neck snares – see description above in mammalian capture methods.

Carbon Dioxide – see description in avian methods.

Aerial Operations. Aircraft, both fixed-wing and rotary-wing (helicopters) are used by WS-California to remove coyotes or pigs. The most frequent aircraft used for aerial shooting and hazing is the fixed-wing aircraft Piper PA-18 Super Cub and Cub Crafters CC-18 Top Cub and rotary-wing Hughes MD500. WS-California conducts aerial activities on areas only under signed agreements or federal Annual Work Plans and concentrates efforts to specific areas during certain times of the year.

Aerial shooting consists of visually sighting target animals in the problem area and shooting them with a firearm from an aircraft. Aerial shooting is species-specific and can be used for immediate damage relief, providing that weather, topography and ground cover conditions are favorable. Aerial shooting can be effective in removing offending animals that have become trap-shy or are not susceptible to calling and shooting or other methods. This method may also be used proactively to reduce local coyote predations in lambing and calving areas with a history or predation.

Fixed-wing aircraft are useful for aerial shooting over flat and gently rolling terrain. Because of their maneuverability, helicopters have greater utility and are safer over timbered areas or broken land where animals are more difficult to spot. Aerial shooting typically occurs in remote areas with low densities of tree or vegetation cover, where the aerial visibility of target animals is greatest. WS-California spends relatively little time flying and shooting over any one area.

Wildlife Services Directive 2.620 and Wildlife Services aircraft-use policy help ensure that aerial shooting is conducted in a safe and environmentally sound manner, and in accordance with federal and state laws (USDA 2020). State Directors and District Supervisors are responsible for the supervision, management, and compliance for all aviation activities within California, and all aircraft used in WS-California activities through contract, agreement, or volunteer shall have been approved by the office of the Wildlife Services National Aviation Coordinator. Wildlife Services Directive 2.615 guides all Wildlife Services shooting activities (USDA 2020). All efforts are conducted in strict compliance with the Wildlife Services Aviation and Safety Manual, the Federal Aviation Regulations, the Fish and Wildlife Act of 1956 (Airborne Hunting), any applicable State and local laws and regulations, WS-California Aviation Safety Plan, Aviation Communication Plans, and Aviation Emergency Response Plans.

Wildlife Services has an Aviation Training and Operations Center located in Cedar City, Utah. Its mission is to improve aerial operations safety and provide training and guidance for Wildlife Services aviation personnel and aerial activities. The policy and primary focus of WS-California and contract aviation personnel is ensuring well-being through safety and accident prevention efforts. Pilots and aircraft must be certified under established WS-California procedures. Only properly trained WS-California employees are approved crewmembers. Ground crews are often used with aerial operations for safety and for providing assistance with locating and recovering target animals.

Body grip traps (also known as quick-kill traps) are used by WS-California to lethally remove beaver and ground squirrels. The body-grip trap is lightweight, easily set, and consists of a pair of rectangular wire frames that close when triggered, killing the captured animal with a quick body blow. Body grip traps are lethal to both target and non-target animals. Body grip traps set for beaver may be used in both urban and rural areas and set location is used to preclude non-target animals from capture.

Snap traps are common household rat or mouse traps. These traps are often used to collect and identify rodent species that cause damage so that species-specific management tools can be applied. If an infestation is minor, these traps may be used as the primary means of management.

Gas cartridges are fumigants used to reduce burrowing wildlife damage. The cartridges are placed in the active burrows of target animals, the fuse is lit, and the entrance is then tightly sealed with soil. The gas cartridges contain two active ingredients, sodium nitrate and charcoal, and once ignited the main combustion product is carbon monoxide. The gas cartridge ingredients are stable in light and are natural plant nutrients. No secondary hazards exist with burrow fumigants because the gases rapidly dissipate (Witmer and Fagerstone 2003). If soils are too porous or too dry, too much gas escapes the burrow system before lethal concentrations are reached (Witmer and Fagerstone 2003). WS-California uses gas cartridges in ground squirrel burrows and predator dens (EPA Labels-APHIS-ONLY Gas Cartridge (EPA. Reg. No. 56228-2) and Large Gas Cartridge (EPA Reg. No 56228-21)). The WS-California program manufactures gas cartridges at the Pocatello Supply Depot and uses den cartridges specially formulated for these purposes. Use of gas cartridges will only be used by qualified WS-California personal who have been trained to distinguish dens and burrows of target species from those of non-target species and not in occupied habitats of T&E species as per listed on label.

Euthanasia - Sodium pentobarbital produces rapid anesthetic action followed by a smooth and rapid onset of unconsciousness. Pentobarsol™ is a veterinary product regulated by the FDA and results in the "rapid, painless, and humane euthanasia of animals." All carcasses would be properly disposed of to avoid secondary contact with other target and non-target species per WS Directive 2.430.

Physical Euthanasia methods – see description above in avian methods.

3.3 Reptilian Methods

Grid searches are performed for the purpose of locating and removing species of snakes that predate on protected ground nesting birds. Grid searches involve 1-3 personnel walking in formation a few feet apart (vegetation dependent) through an affected area to search for snakes. Because this is performed at the request of a management agency to protect T&E species in response to reptilian predation within nesting habitat, WS-California works closely with cooperators to ensure that this technique disturbs the protected species as little as possible. Once snakes are located, they are captured by hand and euthanized.

Funnel traps are a conical funnel and at least one access lid or door. The trap is placed on the ground along a naturally occurring linear object or drift fencing. The trap is designed to allow wildlife to enter the trap through the funnel and then confuse the animal once inside making it difficult for the animal to escape the trap. The traps are unselective, but a live mouse can be used as bait to increase their attractiveness to reptilian predators. Funnel trapping can be an efficient sampling technique, although the literature is ambivalent about the relative performance of pitfall (e.g., Vogt and Hine 1982; Enge 2001) versus funnel traps (e.g., Greenberg et al. 1994; Jorgensen et al. 1998) (Ribeiro-Junior et al. 2008). When evidence of snakes is observed, funnel traps are placed on the borders of the area to be protected to intercept foraging snakes prior to entering the nesting area.

Tube traps are long cylindrical tubes of PVC or clear rigid plastic tubing capped at one end. National Wildlife Research Center (NWRC) ran trials with PVC traps as an inexpensive alternative to standard live traps on Argentine black and white tegu (Avery and Lowney 2016). "The importance of trap-encounter rate and the economy of PVC-type traps make them excellent for intensive trapping efforts" (Avery and Lowney 2016). Tube traps are usually used in concert with

drift fencing. Tube traps are typically not baited. When evidence of snakes is observed, tube traps are placed on the borders of the area to be protected to intercept foraging snakes prior to entering the nesting area.

Drift fencing acts as a vertical barrier that blocks the movement of animals across the landscape. There are multiple variations dependent on habitat and target species; however, WS-California typically uses 25-meter sections of 24-inch-wide plastic mesh attached to wooden stakes driven into the ground. Drift fencing typically guides animals toward a pitfall bucket, funnel trap, or other capture device (Willson and Gibbons 2009). Drift fencing is effective at aiding in capturing snakes. Drift fencing could be used on the outside of a colony or nest area to intercept reptilian predators attempting to access the area.

Physical Euthanasia methods – see description above in avian methods.

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Appendix C-2

CDFA Methods Descriptions

1 Overview

CDFA recognizes the federal expertise in managing wildlife conflicts that Wildlife Services (WS-California) brings to California.[1] The wildlife damage management (WDM) activities and methods that WS-California *currently* uses are described in detail in Appendix C-1. WS-California Methods Descriptions. Should an individual county enter into a Cooperative Service Agreement (CSA) with WS-California, their WDM would be consistent with the descriptions provided in Appendix C-1.

The following is a description of WDM activities and methods that may be used by CDFA and participating California Counties (and their agents, thereof), *independent* of WS-California. However, these activities and methods directly build upon those previously described, and thus are familiar, proven, and compatible. To ensure consistency in how WDM activities and methods are carried out by CDFA (and participating California Counties), CDFA shall adopt the Wildlife Services Directives as part of the WDM Program (USDA 2020).

2 Site Presence

WDM actions require the presence of qualified and properly trained personnel[2] (referred to herein as "wildlife specialists") at the locations where wildlife damage is occurring. Before CDFA and/or participating counties included in the CDFA WDM Program conduct any WDM activities or methods, a written request for assistance from the land or resource owner/manager[3] for public, private, or tribal lands) must be received. Wildlife specialists may use 4-wheel drive vehicles, all-terrain vehicles (ATVs), snow machines, aircraft, boats, or hoof stock for conveyance when conducting WDM activities and methods. When operating on federally or state-owned lands, wildlife specialists must comply with all applicable laws and regulations, as well as all terms and conditions set forth in any memorandum of understanding (MOU) negotiated with the relevant land management agencies.

3 Technical Assistance (All Species)

Technical assistance may be provided by wildlife specialists when a land or resource owner/manager requests assistance in resolving a conflict with wildlife. Wildlife specialists may provide information, demonstrations, technical assistance, and advice on available and effective WDM techniques. Technical assistance may include demonstrations on the proper use of management devices and information and advice on animal husbandry practices, techniques to modify human behavior, habitat management techniques, and animal behavior modification devices. Deciding which recommendations to suggest requires substantial deliberation. Part of the decision-making process may include an on-site visit and/or consultation with the requestor. Generally, several short and long-term management strategies would be described and recommended. Because the requestor is primarily responsible for implementing these strategies, the recommendations would be based on the abilities of

1 There are Wildlife Services (WS) offices representing all 50 states, the District of Columbia, Guam, and the Virgin Islands.

2 As described in this document, "wildlife specialists" refer to CDFA and/or County personnel (or their agents thereof) that have been specifically trained to carry out WDM activities and methods, including technical assistance as well as operational activities in the field. Wildlife specialists are required to undergo periodic education in current WDM techniques (including use of special equipment such as federally-licensed firearms, pyrotechnics, and specialized traps), and to carry out WDM activities and methods in compliance with local, state, and federal laws.

3 The land or resource owner/manager are also referred to as the 'owner/operator' or 'reporting party.'

the requestor, the level of risk, need, and practical application. Compliance with applicable federal, state, and local laws and regulations is the responsibility of the land or resource owners/managers when self-implementing the activities and methods described as part of technical assistance.

3.1 Modification of Human Behavior

Modification of human behavior may be recommended to prevent and resolve conflicts between humans and wildlife. For example, the elimination of both inadvertent feeding (i.e., improper disposal of garbage/storage of camp food, outdoor pet feeding, and feeding of cat colonies) and intentional feeding of wildlife by members of the public may be recommended. Peri-domestic wildlife species (such as raccoons and striped skunks) adapt well to living near humans, and studies have shown increased density of mesocarnivore species along the urbanization gradient in part due to the capitalization of anthropogenic food sources (Salek et al. 2015). Unnatural densities of these species in proximity to conservation lands may result in damage to native or threatened and endangered (T&E) species. Even with considerable effort from land or resource owners/managers, it can be difficult to consistently enforce no-feeding regulations and to effectively educate all people concerning the potential liabilities of feeding wildlife. Other examples of modifying human behavior could include altering activity periods and walking in groups.

3.2 Habitat Modification

Habitat modification can be an integral part of WDM. Wildlife production and/or presence are often directly related to the type, quality, and quantity of suitable habitat. While wildlife specialists may recommend or be consulted on the types of habitat modifications that could be implemented to lessen or avoid damage, in all cases, the land or resource owners/managers would be responsible for evaluating and implementing habitat modifications.

3.3 Animal Husbandry Modification

Animal husbandry modifications include the level of livestock handling and care, shifts in the timing of breeding and births, changes in herding techniques, livestock species selection, and the use of human or animal guards (e.g., dogs, donkeys, and llamas) to protect livestock.

The level of care or attention given to livestock may range from daily to seasonal. Generally, as the frequency and intensity of livestock handling increases, so does the degree of protection. The risk of depredation is greatest in operations where livestock are left unattended for extended periods. This risk can be reduced when operations permit nightly gathering so that livestock are inaccessible during the hours when predators are most active. This risk diminishes as age and size increase and can be further minimized by holding expectant females in pens or sheds to protect births and by holding newborn livestock in pens for the first two weeks. Shifts in breeding schedules can also reduce the risk of depredation by altering the timing of births to coincide with the greatest availability of natural prey to predators or to avoid seasonal concentrations of migrating predators (such as golden eagles).

The use of human custodians and guarding animals may also provide significant protection in some instances. The presence of herders to accompany bands of sheep on an open range may help ward off predators. Guard dogs have also proven successful in many sheep and goat operations. The supply of proven guarding dogs is generally quite limited, and typically requires that people purchase and rear a pup. Therefore, there is usually a four- to eight-month period of time necessary to raise a guarding dog before it becomes an effective deterrent to predators. Because 25

to 30 percent of dogs are not successful even after training, there is a reasonable chance that the first dog raised as a protector will not be effective. Furthermore, the effectiveness of guarding dogs may not be sufficient in areas where there is a high density of predators, where livestock widely scatter to forage, or where dog-to-livestock ratios are less than recommended.

Altering animal husbandry to reduce wildlife damage can also be effective, although it has many limitations. For example, nightly gathering may not be possible where livestock are in many fenced pastures and where grazing conditions require livestock to scatter. Hiring extra herders, building secure holding pens, and adjusting the timing of births can be prohibitively expensive. Furthermore, the costs associated with a change in husbandry practices can often exceed any potential savings because the timing of births is often managed to coincide with weather patterns or seasonal marketing of young livestock.

3.3.1 Physical Exclusion

Physical exclusion refers to the separation of damage-causing wildlife from the resource to be protected and is considered one of the earliest forms of WDM.

Barrier fencing is typically used to prevent access to areas containing infrastructure (including road structures and bridges) and valued property such as gardens, fishponds, trees, orchards, dwellings, livestock or poultry pens, and T&E species. Selection of a barrier system depends on the wildlife species being excluded, expected duration of damage, size of the area or facility to be excluded, compatibility of the barrier with other operations (e.g., feeding, cleaning, harvesting, recreational activity, etc.), possible damage from severe weather, and effect on site aesthetics. The barrier system also depends on the resource being protected and its value. Systems can range from relatively simple systems such as metal flashing and hardware cloth to highly complex mesh and grid systems and electric fencing. Barrier systems can initially be very costly to erect and expensive to maintain, but can provide a long-term, highly effective solution to some damage problems.

Electric fencing could be used to alleviate damage caused by wildlife. The application of electrified fencing would generally be limited to site specific application where predation is occurring in a very limited geographic scale. Limits of this application arise where there are multiple land or resource owners/managers along a wetland, pond, or lake, the size of the area is relatively large, or where the area is in proximity to bodies of water. Predator control through judicious use and placement of electric fences and other barriers, as well as by trapping efforts, have reduced losses of adults, eggs, and/or young (USFWS 1985). While electric fencing may be effective in repelling predators in some urban settings, its use is often prohibited in many municipalities for human safety reasons. Problems that typically reduce the effectiveness of electric fences include vegetation on fence, flight capable birds, fencing knocked down by other animals (e.g., deer and dogs), and poor or intermittent power sources.

Tree protectors and sheathing can consist of wrapping hardware cloth, solid metal flashing, or other materials around the trunk of the tree, and are used to protect trees from beavers by physically preventing the semi-aquatic animal from causing damage. Sheathing or tree protectors could also be used in some situations to prevent access to trees canopies to protect nesting birds from predators. However, sheathing may be impractical where there are numerous plants or trees to protect, so it is mostly used in urban settings where only a few trees or objects need protection.

Netting can be useful in preventing birds from accessing resources or forming large roosts that could cause a risk to human health and safety and/or decrease aesthetics. For instance, the ceiling of parking garages can be netted to prevent pigeons and other birds from roosting above cars and dropping debris and feces on cars and people. Netting

can be installed in hangers to exclude birds from perching or nesting indoors. Netting can be very successful if done correctly but it can be expensive and requires routine maintenance. Netting is also not practical over large areas.

Overhead wire grids can deter birds from using specific areas where they are causing a nuisance (Johnson 1994). The wires represent an obstacle that is difficult for a flying bird to see/navigate and make the area less attractive to birds. Overhead wire grids are more practical and cost effective than netting for large areas; for example, they can be used to keep some waterfowl out of retention ponds on airfields.

Perch inhibitors can be used to keep birds from perching on sensitive equipment and interfering with function. Perch inhibitors can be anything that render the perching area unusable to birds: zip ties, bird spikes, thin wire strung over the perch, golf tees, etc.

Chemical applications/tactile/taste repellents are materials that are rough and can discourage, reduce, or prevent the gnawing behavior of rodents, tacky or sticky substances to prevent perching, or non-hazardous chemical compounds designed to cause pain or discomfort. Abrasives produce an unpalatable surface which irritates the teeth and mouth of rodents when they attempt to gnaw or chew on the surface. Flexible materials, such as sandpaper, grinder pads, and fine-mesh stainless steel screening can be placed on or over objects (e.g., electrical wiring, plastic piping, fruit trees, etc.) that are susceptible to gnawing rodents. Fine sand can be added and mixed with paint, glue, or other suitable liquid adherents to formulate a paste or heavy mixture that can be brushed-on or applied to a surface to discourage rodent gnawing. This method has had limited success when applied or painted on tree trunks to discourage beaver from cutting down trees. Abrasives are most practical where only a few trees or areas need protection. Primary repellents exemplified by tacky or sticky substances to prevent perching, or chemical compounds designed to affect pain or discomfort, evoke a limb withdraw or escape behavior (Clark and Avery 2013). Taste repellents such as methyl anthranilate and activated charcoal have shown to deter geese from grazing and repel passerines in laboratory feeding trials (Mason and Clark 1992).

Surface coverings could be used to provide hides for T&E species and decrease the success rate of predator detection. For example, clay roof tiles have been placed within California least tern colonies to act as chick shelters (USFWS 2006).

3.3.2 Harassment and Deterrent Methods

Harassment and deterrent devices rely on the use of sound, lights, pursuit, or other methods to frighten and disperse animals from the area to be protected. The success of frightening methods depends on animals' fear of, and subsequent aversion to, offensive stimuli. Once animals become habituated to a stimulus, they often resume their damaging activities. Considerable effort is usually required to consistently apply frightening techniques and then vary them sufficiently to prolong their effectiveness. Over time, some animals learn to ignore commonly used frightening methods that are no longer perceived as threats. In many cases animals frightened from one location become a problem at another.

Distress/predator calls are electronic devices that mimic sounds exhibited when target species are in distress, which is intended to cause a flight response and disperse target animals from the area. This technique is primarily used for avian management. Alarm calls are given by birds when they detect predators, while distress calls are given by birds when they are captured by a predator (Seamans and Gosser 2016). When other birds hear these calls, they believe a predator is present or a bird has been captured (Seamans and Gosser 2016).

Propane exploders/cannons produce noise that is intended to represent a firearm discharge. They are attached to a propane tank and regulated to discharge at certain intervals. Propane cannons work best when the interval of the discharge is random, the cannons are moved regularly, and they are combined with other methods, such as effigies. Although a propane exploder can be an effective dispersal tool for birds in agricultural settings, resident waterfowl in urban areas are more tolerant of noise and habituate to propane exploders relatively quickly.

Pyrotechnics are best described as controlled fireworks and can be safely used in a number of situations involving birds (USDA 2010). Pyrotechnics include, but are not limited to: screamers, bird bombs, CAPA cartridges, and 12-gauge cracker shells. 12-gauge cracker shells are shotgun shells containing an explosive round that is projected up to 200 feet in the air before exploding. Bird bombs and screamers are fired from 6 mm starter pistols; they are used similarly to 12-gauge cracker shells, but they travel a shorter distance. For example, bird bombs travel approximately 75-100 feet before exploding. Screamers are similar to bird bombs, but they whistle in flight, leave a small trail of smoke in their wake, and do not explode. CAPA cartridges are fired from an 18.6 mm launcher and travel approximately 1,000 feet and explode generating a sound of approximately 150 dB at 32 feet.

As with frightening devices and propane exploders, the effects of pyrotechnics on nontarget wildlife need to be considered. For example, special-status birds or birds protected under the Migratory Bird Treaty Act (MBTA) may be disturbed or frightened from nesting sites.

Paintball guns are used as a non-lethal harassment method to disperse wildlife from areas using physical harassment. Paintballs are occasionally used to harass species such as waterfowl, raptors, and doves and to remove swallow nests. Paintballs can be used to produce negative physical and visual stimuli that can aid in the dispersal of birds from areas where conflicts or threats of conflict are occurring. Washable, clear paintballs would be used unless otherwise directed by the state or federal wildlife agency with jurisdiction over the lands where this method is used.

Water spray can be used to harass or disperse wildlife. It can be used to produce negative visual and physical stimuli to disperse birds such as swallows from areas where conflicts or potential conflicts are occurring. High pressure water spray is also used to remove swallow nests from areas where conflict is occurring. Work involving the removal of active nests is always performed under a MBTA depredation permit. Motion triggered sprinklers can also be used to deter deer and birds from damaging landscaping and smaller plantings.

Lasers and lights are used with mixed results to frighten target wildlife. Lights can be used to flush avian predators off hunting perches; however, many animals can become accustomed to such lights over time. Lasers have shown some effectiveness with waterfowl, wading birds, gulls, vultures, and crows (USDA 2003). Lasers have a narrow, targeted beam which are used to depict a novel object approaching the bird that elicits a flight response. Best results are achieved under low-light conditions (i.e., sunset through dawn) and targeting structures or trees proximate to roosting birds, thereby reflecting the beam (USDA 2003; Blackwell et al. 2002).

Scarecrows and effigies often depict predator animals (e.g., alligators, owls), people, or mimic distressed target species (e.g., dead ravens, dead crows) and they are intended to elicit a flight response from target birds, which disperses those birds from the area. Avery et al. (2008) found that effigies could be effective at dispersing crows. When crow aggregations are relatively small, then effigies might suffice, but for large roosts it is likely that reinforcement with additional methods such as pyrotechnics or distress calls will be needed (Avery et al. 2008). Crow or raven effigies are mainly used to protect nesting colonies or individual nests from avian predators. In general, scarecrows would be most effective when they are moved frequently, alternated with other methods, and are well maintained. Scarecrows tend to lose effectiveness over time and become less effective as populations of

target species increase (Smith 1999), though they have been used effectively to deter raptors from establishing nests on certain power structures by mimicking utility staff accessing the tower.

Eye-spot balloons and mylar strips and balloons provide visual harassment for wildlife. Eye-spot balloons have large eyes that are intended to give birds a visual cue that a large predator is present. Mylar® tape and flags can also be used to deter birds from certain areas. These materials produce sound and flashes in the sun when wind blows over it that may frighten some species.

Radio-controlled vehicles can be used to haze wildlife from undesirable areas. Radio-controlled boats, cars, and drones can be used to move wildlife off ponds, saturated areas, and areas that are otherwise impassible. These tools are used to provide wildlife a visual stimulus to leave the area and not used to make (physical) contact with wildlife.

Vehicles can be used to pursue animals as a form of harassment. The purpose is to approach the animals with a large object, sometimes with lights flashing and a siren, to scare the birds away from an area. This technique is often used in airports. The vehicle is never used to run over or injure the animal.

Tactile repellent products reportedly deter birds from roosting on certain structural surfaces. Commercially available products such as polybutene present a tacky or sticky surface that the birds avoid. Different formulations, both liquid and gel, may be appropriate for many different situations, such as trees, shrubbery, ledges, beams, windowsills, gutters, cornices, roof lines (perimeters), and air conditioners (Zemsky 1995). The substance does lose its tackiness after approximately one year; moreover, the old material would need to be removed and new material reapplied (Zemsky 1995).

Olfactory repellents are used to deter animals from using specific areas for shelter or feeding. These commercially available products contain strong herbal odors. This smell encourages the sheltering animal to vacate the specific location where applied.

Dogs have been used successfully to disperse birds, especially waterfowl in urban and suburban areas (Seamans and Gosser 2016). Properly trained dogs provide harassment that birds recognize as threats. As with any bird dispersal technique, dogs are more effective when used in combination with other methods, as birds may become habituated to dogs and may no longer react to their presence (Seamans and Gosser 2016).

4 Operational Assistance

The CDFA WDM Program includes WDM activities and methods that would use specialized equipment (i.e., pyrotechnics, specialized traps, and firearms). However, the cost and required expertise or training needed to effectively use specialized equipment, may be a limiting factor. In certain cases, the specific WDM activity or method may require coordination with and assistance from WS-California wildlife specialists.

The majority of operational assistance activities (activities conducted in the field) are anticipated to be performed by wildlife specialists (or their agents) or by WS-California wildlife specialists as part of a cooperative service agreement (CSA) with a county (described in Appendix C-1). Emergency/rapid response operational assistance activities may be conducted by CDFA, Counties, or WS-California wildlife specialists, as appropriate.

4.1 Avian Methods

4.1.1 Physical Exclusion

Physical exclusion refers to the separation of damage causing wildlife from the resource to be protected and is considered one of the earliest forms of WDM. Examples of physical exclusion techniques include:

Netting – see description above in technical assistance.

Overhead wire grids – see description above in technical assistance.

Perch inhibitors – see description above in technical assistance.

Chemical applications/tactile/taste repellents – see description above in technical assistance.

Surface coverings – see description above in technical assistance.

One-way Door Excluders are devices usually used in urban settings to allow an animal to leave an area where it is unwanted by way of a one-way door or a narrowing exit that prevents them from re-entering through the same entrance. They can be used for small mammals, meso-mammals, bats, and some bird species. They are installed over a hole (usually in the side of a house or other building) with the door opening from the inside of the structure outside. Once the animal has exited the door serves as a barrier to re-entrance. Once it is ascertained that no more animals are in the structure, the land or resource owner/manager is usually advised to repair the hole.

4.1.2 Harassment and Deterrent Methods

Distress/predator calls – see description above in technical assistance.

Propane exploders/cannons – see description above in technical assistance.

Pyrotechnics – see description above in technical assistance.

Water spray – see description above in technical assistance.

Lasers – see description above in technical assistance.

Scarecrows and effigies – see description above in technical assistance.

Eye-spot balloons and mylar strips and balloons – see description above in technical assistance.

Radio-controlled vehicles – see description above in technical assistance.

Vehicles – see description above in technical assistance.

Tactile repellent products – see description above in technical assistance.

Olfactory repellents – see description above in technical assistance.

Dogs – see description above in technical assistance. Government-owned and employee-owned trained dogs will accompany wildlife specialists when there is an operational need. Dogs would not be allowed to intentionally kill animals.

Paintball guns – see description above in technical assistance.

4.1.3 Capture Methods

Live capture methods are used to capture individuals causing damage. Most of these methods involve the use of traps set to capture and hold the animal alive until personnel arrive. The animal can then be euthanized or released as appropriate. Some individuals are relocated with the approval of California Department of Fish and Wildlife (CDFW) and United States Fish and Wildlife Service (USFWS). Any traps set by wildlife specialist shall be checked by the wildlife specialist, the land or resource owner/manager, or their designated agent.

Air cannon/rocket nets are typically used for larger birds, such as waterfowl and turkeys, and use compressed air to propel a net up over birds, which have been baited to a particular site. The habitat must be relatively flat, open, and void of vegetation that could become tangled in the net and allow for target species to escape.

Bow nets/E-Z catch nets are normally used to capture raptors, but may also be used for European starlings, shorebirds, and other species using visual bait and/or conspecific decoys. Bow nets are set on the ground and are remotely triggered from a nearby observation site. Once triggered, the net envelops the target birds. The captured bird is removed from the net as gently and quickly as possible to avoid entanglement and additional stress. Wildlife specialists shall positively identify the target species prior to deploying the trap. These nets are operated by a spring-loaded system with a net between two curved (bowed) rods. When used to capture raptors, a lure animal is placed at the center to attract the raptor to the trap. This method can also be elevated to increase success of capturing certain species. E-Z catch nets are similar to bow nets except that they have a treadle/trigger that is set off by the animal.

Drop nets are nets suspended over a pre-baited site and manually or remotely triggered to drop on target animals. Decoys (live and/or fake) may also be used to enhance the effectiveness of drop nets. Drop nets require specific knowledge of the targeted species' congregation locations and timing to be effective. CDFA/county wildlife specialists would first monitor the pre-baited site and when the target species is in the correct location under the nets, and then activate the net from a nearby location, quickly securing the target wildlife to prevent escape.

Hand nets are used to catch birds in confined areas (e.g., buildings). Most hand nets resemble fishing dip nets with soft netting of various grids and diameters mounted on a long handle. A variation of the hand net is a round net with weights at the edges of the net. It is thrown and is like throw nets used for fishing. Hand nets are a species-specific, live-capture technique.

Mist nets are more commonly used for capturing small-sized birds but can be used to capture larger birds such as ducks and ring-necked pheasants or smaller hawks and owls. Mist nets are fine silk or nylon nets, usually black or tan in color, and range from 3 to 10 feet wide and 25 to 35 feet long. Net mesh size determines the species of birds that can be caught. They are strung between poles in locations where the target birds are known to travel (i.e., along a stream, across an opening in a wooded area) so that the nets form loose pockets. When the bird flies into the nets they are caught up in the pockets. Mist nets can also be used in doorways. Mist nets are monitored by personnel and birds are removed promptly.

Dho-gazza traps employ larger gauge mist nets that are strung between poles with a lure animal placed inside of the nets to attract the target species to the trap. The mist nets are set to breakaway and thus wrap the raptor up in the net. This trap is most often used to capture northern harriers.

Net guns/launchers use a firearm blank or compressed air to propel a weighted net up over birds, which have been baited to a particular site or habituated to the close proximity of human presence.Net guns are handheld and manually discharged while net launchers are ground based and remotely discharged from a nearby observation site.

Padded-jaw foot-hold traps altered for birds. (Full padded-jaw foot-hold description can be found in the Mammalian Methods section). Modified Padded-jaw foot-hold traps can be used for avian species. For avian species the factory supplied springs are weakened or replaced to decrease the amount of pressure, and either surgical tubing or foam is added for extra padding. These traps are placed where target birds have been observed perching on the ground. The trap is anchored so that the captured bird cannot leave the location.

Pole traps (Verbail or modified padded-jaw foot-hold traps) are traps on the top of a pole and are primarily used to capture raptors. "Pole traps are live traps that can be effective and humane tools for alleviating certain problems caused by raptors" (USFWS 2005). Depending on the species being trapped, the modified padded-jaw foot-hold trap size, pole height, trap placement, and trap location are all taken into consideration by wildlife specialists prior to setting. The padded-jaw foot-hold trap is highly modified with the original springs either replaced or weakened in addition to having off-set jaws, and either surgical tubing or foam rubber securely attached to the already rubberized jaw for extra padding. Traps are attached to a guide rod or thick wire that runs from the trap down the pole to the ground. Once an animal is captured, the trap and raptor slide down the guide to the ground for handling. A Verbail trap consists of a platform or stand wrapped with a nylon cord and associated steel spring placed on top of a pole. When tripped, the cord wraps around the bird's foot and holds it. The steel spring is attached to a guide wire which allows the trap to slide down the pole to the ground.

Bal-chatri traps (BC traps) consist of a small wire cage with monofilament nooses attached to the top and sides of the trap. The monofilament test line (ranging from 8.25-pound test fishing line) and noose size will vary depending on the size of the target species. The trap is baited with a mouse and/or other live bait depending on the size of the target species; the lure animals are protected inside the trap from the target species. Cages are generally constructed of ½ inch wire hardware cloth and may be 2-3 inches tall and 10-14 inches square. A 2 to 4 pound weight (such as large fishing weights or bench press weights) are attached to the trap to prevent the raptor from moving the trap once it is caught. These traps would be deployed in the line of sight of the target raptor and would be constantly monitored by wildlife specialists.

Phai hoop traps have a circular shape and have many upright nooses placed all along its circumference. A lure animal is placed in the center of the hoop. The trap is deployed within sight of a raptor, similar to a BC trap. As the raptor extends its legs to grab the lure, it becomes ensnared by the hoop's nooses.

Pigeon harnesses are a piece of leather or heavy material that fits onto lure bird such as a pigeon or starling like a backpack and allows the lure bird its full range of motion. Heavy weight monofilament line tied into sliding nooses are attached to the backpack and a ground anchor or weight is attached to secure everything to the ground. The pigeon harness is deployed similarly to the BC trap and the nooses that are attached to the harness catch on the targeted raptor's talons, toes and/or feet. This method is effective at capturing peregrine falcons; it is constantly monitored and only used when a target raptor is present.

Funnel traps are used to live-capture waterfowl. The traps can vary in size and are usually constructed of netting or wire mesh. Traps are set up in shallow water and baited; they allow waterfowl to enter the trap but prevent them from exiting. Traps would be checked regularly to address live-captured waterfowl.

Nest box traps are effective in capturing cavity nesting birds, such as European starlings, and operate similar to other live-capture traps. Nest box traps allow birds to enter a nest box, but not exit.

Nest/walk-in traps are similar to box or decoy traps. They are placed over an active nest or baited with food and allow the target bird to pass through a funnel, one-way, or drop-down door that confines the target. Nest and walk-in traps are effective in capturing ground nesting birds such as cormorants, ducks, geese, and ground feeding birds such as rock pigeons and mourning doves.

Swedish goshawk traps are compartment-style traps with a lower bait cage that houses a lure animal. The upper compartment is a trapping mechanism that consists of an "A" frame made of wood or metal along with a trigger that is mounted atop the bait cage. The side panels are generally made of mesh wire or netting. The sides of the "A" are hinged so that the sides are held open in a "H" shape by a trigger that stretches the length of the trap. The trigger mechanism is hinged in the middle. As a raptor enters the trapping mechanism to investigate the lure in the bait trap, it lands on or brushes against the trigger, which collapses and allows the sides to close back into an "A" shape trapping the raptor inside (Meng 1971; Kenward et al. 1983). The doors are held closed by springs. The bait cage can hold multiple lure animals to increase movement and/or visibility of the trap. Lure animals are provided with food and water while in the bait cage.

Cage traps are non-lethal capture devices. The size of the cage trap depends on the size of the targeted species; this helps limit the capture of non-target species by physically excluding them from the trap. Traps are set near signs of damage or in areas where the target species is known to travel and are usually baited with species-specific baits. Cage traps set by wildlife specialists would be checked daily. Cage traps are typically set with a bait or lure to encourage the target species to enter the trap. Baits can be chosen to be selective for target species. A trigger mechanism usually located at the back of the trap is triggered by the animal and the trap closes. The animal is enclosed in the trap and held until it is subsequently released or euthanized. Because the animal is held alive, if a non-target animal is captured, it can usually be released unharmed.

Box traps are similar to cage traps. They are rectangular in shape and either have a door that is triggered when an animal steps on a treadle or is a one-way door. The trap is baited with a food item that encourages the animal to walk through the door or the bait is placed in the expected path of the animal to lure it towards the trap.

Decoy traps are similar in design to the Australian Crow Trap as reported by McCracken (1972) and Johnson and Glahn (1994). Decoy traps are commonly rectangular, and they are generally constructed of a wooden or metal frame and wire mesh or netting to form an enclosure, which can be constructed in a variety of sizes, depending on the target species and the number of birds likely to be captured. Sides go up above the middle panel with the funnels and have perches to encourage birds to stay above the funnels, so they do not try to escape. Decoy traps used by wildlife specialists would target social flocking bird species such as crows, starlings, house sparrows and blackbirds. Live decoy birds of the same species being targeted are usually placed in the trap with sufficient food and water to assure their survival. Perches are configured in the trap to allow birds to roost above the ground and in a more natural position. The feeding behavior and calls of the decoy birds attract other target birds to the trap. In addition, the traps are often baited with food attractants. Openings in the enclosure allow target birds to enter the enclosure to feed on the bait. Openings are generally placed at the top of the enclosure and are generally about the length and width of target bird species with their wings folded so birds can enter but are unable to exit with their

wings extended as they are flying upwards toward the openings. Active decoy traps are monitored daily to address captured birds and to replenish bait and water. Depending on design, decoy traps can be portable or permanent. Portable decoy traps generally consist of several parts and panels that require assembly once transported to a location where target animals are active.

Corral traps could be used to live-capture birds, especially waterfowl. Corral traps can be effectively used to live-capture waterfowl during the annual molt when birds are unable to fly. Each year for a few weeks in the summer, waterfowl are flightless as they are growing new flight feathers. This method consists of setting up an enclosure with an open end consisting of several movable panels. The birds are then surrounded by personnel and slowly guided into the corral trap and the panels are closed behind them. This method is labor intensive and requires multiple individuals to participate in the drive.

4.1.4 Lethal Methods

Water spray – see description above in avian harassment and deterrent methods. This method can be lethal to chicks and eggs when used on active nests. A MBTA depredation permit is required to use this method on active nests.

Shooting. Licensed firearms are used to selectively remove individual target animals. Shooting is a very targeted method, and a properly placed gunshot can cause immediate insensibility and a humane death (AVMA 2020). As needed, wildlife specialists may kill animals as quickly and humanely as possible; under some conditions a gunshot may be the only practical method of euthanasia (AVMA 2020). All applicable firearm safety precautions, laws, and regulations governing the use of firearms shall be followed by wildlife specialists when conducting WDM activities. Firearm safety training shall be required prior to use of this approach. The National Rifle Association (NRA) certified instructors and the NRA's curriculum for the basic pistol, rifle, and shotgun certifications are the officially recognized program for firearms safety training. CDFA/counties would be required to periodically receive updated trainings. Wildlife specialists may use firearms in combination with other WDM techniques and/or modifications listed below.

- *Calling* consists of using voice, mouth, handheld, or electronic calls to draw predators into the area. Calling is often used to draw the target species into firearm range.
- *Night shooting* may be conducted with spotlights or night vision devices. Night vision devices are undetectable to the surrounding environment. Spotlights are high intensity lights that are used to identify and cause the target species to temporarily pause its movements and/or flush when exposed for a length of time.
- *Non-lead (non-toxic) ammunition.* Effective July 1, 2015, California state law (AB711) and subsequent regulations promulgated by the California Fish and Game Commission require the use of nonlead ammunition in a phased approach when taking wildlife for recreation or depredation purposes. Effective July 1, 2019, nonlead ammunition is required for the taking of any wildlife for any reason. More information on the regulations and phased approach can be found at https://www.wildlife.ca.gov/Hunting/Nonlead-Ammunition.
- *Suppressors.* Firearms create high intensity sound for short durations. When possible, and without reducing the effectiveness of the methods, CDFA/counties may use suppressors (silencers) and specific ammunition (subsonic) to minimize the audio report of firearms. Suppressors and subsonic ammunition are most often used with rifles. Shotguns cannot always be suppressed without affecting shot pattern and/or shooting accuracy.

Carbon dioxide (CO2) is sometimes used to euthanize birds that are captured in live traps. Live birds are placed in a container, such as a plastic 5-gallon bucket, or chamber that is then sealed shut. Carbon dioxide gas is released into the bucket or chamber and birds quickly die after inhaling the gas. This method is approved as a euthanizing agent by the American Veterinary Medical Association (AVMA) (AVMA 2013). Carbon dioxide gas is a byproduct of animal respiration, is common in the atmosphere, and is required by plants for photosynthesis. It is used to carbonate beverages for human consumption and is the gas released by dry ice.

Avicides. No avicides shall be directly used by CDFA/counties wildlife specialists as part of the CDFA WDM Program. Use of DRC-1339 is limited to WDM activities carried out by WS-California wildlife specialists. CDFA/counties may participate through cooperation or funding.

DRC-1339 is a slow acting avicide that is registered with the U.S. Environmental Protection Agency (EPA) for use on a number of bird species (e.g., ravens, crows, pigeons, gulls, blackbirds, and European starlings), and on various bait carriers, such as grain, meat baits, eggs, sandwich bread, and French fries. DRC-1339 is only available for use in California under WS-California supervision. DRC-1339 was developed as an avicide because of its differential toxicity to mammals. DRC-1339 is highly toxic to sensitive bird species but only slightly toxic to non-sensitive birds, predatory birds, and mammals. Most bird species that are responsible for damage, including but not limited to starlings, blackbirds, pigeons, crows, magpies, and ravens, are highly sensitive to DRC-1339. Many other bird species such as raptors (Schafer 1981), sparrows, and eagles are classified as non-sensitive. Secondary poisoning has not been observed with baits treated with DRC-1339. Numerous studies show that DRC-1339 poses minimal risk of primary poisoning to non-target species and T&E species (EPA 1995). This can be attributed to relatively low toxicity to species that might scavenge on birds killed by DRC-1339 and DRC-1339's tendency to be almost completely metabolized in the target birds, which leaves little residue to be ingested by scavengers. Secondary hazards of DRC-1339 are almost non-existent. DRC-1339 acts in a humane manner, producing a quiet and apparently painless death.

DRC-1339 is unstable in the environment and degrades rapidly when exposed to sunlight, heat, or ultraviolet radiation. The half-life is about 25 hours, which means it is nearly 100% broken down within a week, and identified metabolites (i.e., degradation chemicals) have low toxicity. DRC-1339 is highly soluble in water, but does not hydrolyze, and degradation occurs rapidly in water. DRC-1339 tightly binds to soil and has low mobility.

Studies continue to document the effectiveness of DRC-1339 in resolving blackbird/starling problems at feedlots (e.g., West and Besser 1976) and dispersing crow roosts in urban/suburban areas (e.g., Boyd and Hall 1987). Glahn and Wilson (1992) noted that grain baiting with DRC-1339 is a cost-effective method of reducing conflicts with blackbirds and sprouting rice.

Active nest destruction is a dispersal technique used to encourage adult birds to leave the area after their nests and eggs are destroyed. In addition to dispersing birds, this method may also reduce the aggressive nature of adult birds during the nesting period. For birds protected under the MBTA, the USFWS permits "active nest destruction" only under the issuance of a depredation permit. This control method is target-specific, with very little chance for the take of non-target species.

Egg addling/oiling are methods of suppressing reproduction in local predating bird populations by destroying egg embryos prior to hatching. Egg addling is conducted by vigorously shaking an egg numerous times, causing detachment of the embryo from the egg sac. Egg oiling is a method for suppressing reproduction of predating birds by placing a small quantity of food grade corn oil on eggs in nests. The oil prevents exchange of gases and causes asphyxiation of developing embryos and has been found to be 96-100% effective in reducing hatchability (Pochop,

Cummings, Steuber et al. 1998; Pochop, Cummings, Yoder et al. 1998). The EPA has ruled that use of corn oil for this purpose is exempt from registration requirements under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). To be most effective, the oil should be applied anytime between the fifth day after the laying of the last egg in a nest and at least five days before anticipated hatching. Egg addling and oiling is different than nest destruction in that the incubating birds generally continue incubation and do not re-nest. Egg addling and oiling are only done after positive identification of the nesting species, as such this method is extremely target specific and poses no threat to non-target species.

Snap traps are common household rat or mouse traps usually placed inside structures. Modified snap traps can be used to remove individual European starlings and other cavity nesting birds. These traps are sometimes used to target species-specific offenders entering small cracks where other types of traps will not fit. The trap treadle is placed near the damaged area caused by the offending bird. Positive species identification and monitoring of species activity around the entry point limit the take of non-target species.

Physical Euthanasia methods include shooting, cervical dislocation, decapitation, and stunning. When properly used by skilled personnel, AVMA states that physical methods of euthanasia may result in less fear and anxiety and be more rapid, painless, humane, and practical than other forms of euthanasia. Shooting may be the quickest and only method available under most field conditions. Manual euthanasia methods may be used to euthanize small birds, rodents and reptiles in limited circumstances as acceptable to AVMA. All euthanasia methods should be performed discretely by properly trained personnel to minimize stress to the animal (AVMA 2020).

4.2 Mammalian Species Methods

4.2.1 Physical Exclusion

Physical exclusion refers to the separation of damage causing wildlife from the resource to be protected and is considered one of the earliest forms of WDM.

Barrier fencing – see description in technical assistance.

Electric fencing – see description in technical assistance.

Tree protectors and sheathing – see description in technical assistance.

Chemical applications/tactile/taste repellents – see description above in technical assistance.

Surface coverings – see description above in technical assistance.

One-way Door Excluders – see description in avian physical exclusion.

4.2.2 Harassment and Deterrent Methods

Pyrotechnics – see description above in technical assistance.

Water spray – see description above in technical assistance.

Lasers – see description above in technical assistance.

Scarecrows and effigies – see description above in technical assistance.

Eye-spot balloons and mylar strips and balloons – see description above in technical assistance.

Vehicles – see description above in technical assistance.

Dogs – see description above in avian harassment and deterrent methods.

Rubber bullets/beanbag rounds may be used to harass or disperse wildlife causing damage or wildlife in proximity to people. This hazing may resolve or prevent human/wildlife interaction.

Fladry/Turbo fladry may be used to discourage deter wolves from entering an area. Fladry is a single strand of polyline with flagging attached (Young et al. 2015). Turbo fladry is electrified as in an electric fence. The key to fladry is that it is most effective when it is installed to be highly visible (UCCE 2019). Since turbo fladry is electrified, it tends to be effective longer (Lance et al. 2010); for example, when a wolf tests the fladry it is shocked. Wildlife specialists may provide guidance and/or assist land or resource owners/managers with the installation of fladry or turbo fladry. Fladry and turbo fladry are temporary alterations to habitat. Turbo fladry may provide livestock owners' temporary relief (Davidson-Nelson and Gehring 2010) and is probably only effective for a timeframe measured in months (UCCE 2019). It is recommended that once livestock are moved or wolf activity at the site decreases, that the turbo fladry be removed.

4.2.3 Capture Methods

Box traps – see description above in avian methods.

Net guns/launchers – see description above in avian methods.

Hand nets – see description above in avian methods.

Cage traps see additional description above in avian methods. Cage traps used to capture mountain lions are typically constructed of commercial livestock panels made of 3/16-inch galvanized welded rods. The top, sides, front, and bottom panels are welded together, and panel openings are approximately 2-inch x 4-inch. These cage traps may have a treadle-type trigger or trip line and a single-catch, multi-catch, or gravity door.

Large cage traps can be used to capture bobcats and feral dogs. For the purposes of this description, large cage traps are larger than 12-inch x 12-inch x 36-inch, but they do not include culvert traps (see below). Large cage traps vary in size and shape depending on the species being targeted. Bobcat or dog-size cage traps are made of welded wire, utilize a treadle-type trigger or trip line system and close with a spring or gravity door.

Cage traps measuring 12-inch x 12-inch x 32-inch and smaller are typically used to capture smaller animals (e.g., the size of a raccoon). They are often set in urban areas to capture meso-mammals such as raccoons and skunks that are causing damage. While many cage traps are welded wire style traps, some small cage traps are constructed from a tube or a plastic box. The trap functions in a similar way to the more common welded wire style traps.

Clover traps are a type of box trap used to capture deer. They measure approximately 4 feet (height) x 3 feet (width) x 6 feet (length) and are comprised of metal tubing frame covered with a heavy netting. Bait is put at the back of the trap behind a trigger line. When the animal trips the string, the door is released and closes. Some modified

designs allow the trap to be collapsed by handlers when the deer is captured to facilitate restraint of the deer and minimize struggling.

Culvert traps are a type of trap constructed of solid material as opposed to welded wire or livestock panels used in large cage traps. They have differing trigger systems but usually utilize swing doors and are often on a wheeled platform or trailer for transport. This type of trap can be used for black bears that are in urban/suburban settings, although they can also be used in rural areas and for other species. Due to the size and weight of most culvert traps, they are primarily restricted to use near roadways, although models exist that may be disassembled and reconstructed in remote areas. The type of bait used depends on the nature of the damage problem and target species. All culvert traps would be checked daily. Non-target animals are generally released uninjured, and target animals are usually euthanized or relocated as appropriate and when authorized by the CDFW.

Corral traps are used to live-capture mammals, primarily feral swine. Corral traps are circular pens 3 to 10 meters in diameter and constructed of panels or cattle fencing, which can be interconnected to expand or contract the size of the corral. Corral traps employ a lift up or side swing head gate or drop-down net to allow access for the feral swine to enter.

Pig brig traps are a circular trap of netting supported by t-posts. After a period of time during which the net is suspended above the ground so that pigs can go in and out of the area and eat bait, a net skirt is attached to earth anchors on the inside of the trap. Pigs are still able to nose their way under the skirt and into the trap, however they are prevented from exiting. This trap allows for multiple captures of animals.

Snares made of wire or cables are among the oldest wildlife management tools and are generally not affected by inclement weather. They can be used effectively to catch most species. Snares may be employed as either lethal or live-capture devices depending on how or where they are set. Most snares are also equipped with a swivel to minimize injuries to the captured animal and reduce twisting and breakage of the snare cable. Breakaway devices can also be incorporated into snares, allowing the loop to break open and release the animal when a specific amount of force is applied. These devices can improve the selectivity of cable restraints to reduce capture of non-target species.

Common types of snares include:

- Neck snares are set to capture an animal by the neck and are usually lethal, but stops can be applied to the cable to make the snare a live-capture device. Snares positioned to capture the animal around the body can be useful live-capture devices. Snares can be effectively used wherever a target animal moves through a restricted lane of travel (i.e., “crawl holes” under fences, trails through vegetation, or den entrances). When an animal moves forward into the loop formed by the cable, the snare tightens, and the animal is held.
- Collarum™ is a non-lethal, spring-powered, modified neck snare device that is primarily used to capture coyotes. The trigger is designed specifically for canines, which use a distinct pulling motion to set off the device. The device uses an attractant and is activated when an animal bites and pulls a cap. The snare is then projected from the ground up and over the head of the coyote. A stop on the device limits loop closure and prevents capture of smaller non-target wildlife. As with other types of snares, the use of the Collarum™ device to capture coyotes is greatly dependent upon finding a location where they frequently travel.
- Foot snares are a spring-powered non-lethal device, activated when an animal places its foot on the trigger pan. In some situations, using hanging snares to capture wildlife is impractical due to the behavior or morphology of the animal, or the location of wildlife conflicts. Neck snares must be set in locations where the

likelihood of capturing non-target animals is minimized, but foot snares with built-in pan tension devices can be set to exclude animals lighter than the target animal.

- Foot snares set for bear are usually set with the trigger in a vertical pipe, large enough for a bear's paw, buried vertically, so that the top is flush with the ground. The cable loop is placed around the circumference of the pipe, and bait is placed in the pipe, under the trigger. When the animal reaches into the pipe, it sets off the trigger and a cable loop is propelled onto the animal's leg.

Catch poles are handheld devices used to capture or safely handle animals. A catchpole is a hollow pipe with an internal cable or rope that forms an adjustable noose at one end. The free end of the cable or rope extends through a locking mechanism on the end opposite of the noose. By pulling on the free end of the cable or rope, the size of the noose is reduced sufficiently to hold an animal. For WDM, catch poles are primarily used to capture animals partially restrained by barriers (i.e., a raccoon trapped in a building) or to remove live animals from traps without danger to or from the captured animal.

Suitcase or basket traps are designed to live-capture beaver. The traps are constructed of a metal frame hinged with springs and covered with chain-link fence. When set, the trap is opened to allow an animal to enter and when tripped, the metal frame closes like a suitcase around the animal. These styles of traps are set in the shallows of waterways (i.e., ponds, rivers, creeks, lakes, etc.) near or on the shoreline or bank so that a captured beaver would always have access to air. They are not set underwater where a triggered trap would be totally submersed in water. Basket-type traps are live-capture traps that would be checked daily by wildlife specialists, the land or resource owners/managers, or their designated agent. These traps are primarily used in rural or restricted access areas but can be set in urban areas if they do not present a hazard to pets (companion animals) or children.

E-zee set or gravity catch traps consist of a welded metal frame fitted with a front grate, wide mesh, and pressure trigger. These traps are set on or near beaver dams where water can flow through the grate. When a beaver brings material to plug the flowing water, the top of the trap is released and drops to surround the animal. These traps have no springs and are considered safer for public access areas.

Padded-jaw foot-hold traps are coil spring traps with rotating jaws. They have centrally attached inline shock springs, swivels to allow for movement, and are equipped with non-hardening rubber on the face of the jaw. These traps come in several sizes depending on the target species. Padded-jaw foot-hold traps are designed to close on an animal's foot and hold the animal without injuring it. They have adjustable pan tension triggers which allow the exclusion of animals smaller than the target species. These traps can be used for live-capture and release or hold for subsequent euthanasia. Padded-jaw foot-hold traps usually permit the release of non-target animals unharmed.

Padded foot-hold traps can only be used in California for the protection of public safety and of T&E species. (In *Nat. Audubon Society v. Davis* (N.D. Cal. 2000) 144 F. Supp. 2d 1160, the United States District Court for the Northern District of California held that Section 3003.1(c) of the California Fish and Game Code, which generally prohibits the use of any steel-jawed leghold trap except when necessary to protect human health or safety, did not apply to federal agencies engaged in wildlife management on federal lands or in conservation efforts under federal law, including the protection of T&E species.) Target animals may be euthanized, released on site, or relocated; non-target species may be released on site.

These traps are placed in the travel paths of target animals, and some are baited or scented, using an olfactory attractant, such as the species' preferred food, urine, or musk/gland oils. The use of baits also helps to facilitate the prompt capture of target predators. This often decreases the total time traps are in the field, thereby lowering

risks to non-target animals. In some situations, a draw station—a carcass, or large piece of meat—is used to attract target animals. In this approach, one or more traps are placed in the vicinity of the draw station.

Padded-jaw foot-hold traps set for mountain lions, bobcats, coyotes, and feral dogs are set with dirt or debris (e.g., leaf litter or rotting wood) sifted on top. The traps can be staked to the ground securely, attached to a solid structure (such as a tree trunk or heavy fence post), or used with a drag that becomes entangled in brush to prevent the trapped animal from escaping. Anchoring systems should provide enough resistance that if a larger animal is unintentionally captured, it should be able to either pull free from the trap or be held to prevent escaping with the trap on its foot.

Effective trap placement also contributes to trap selectivity. To minimize risk of capturing non-target animals, the user must be experienced and consider the target species' behavior, habitat, environmental condition, and the habitats of non-target animals. The pan tension, type of set, and attractant used greatly influence both capture efficiency and risks of catching non-target animals. The level of trap success is often determined by the ability of the user, through training, skill, and experience, to adapt the trap's use for specific conditions and species. Traps would be checked daily and are required to follow state laws and regulations regarding the setting and checking of traps.

Trained dogs/hounds are used to trail certain species, identify sites to set equipment where target wildlife might be travelling, to tree specific species of wildlife for capture or removal, and as a decoy to draw target species closer for shooting activities.

- *Decoy dogs* are sometimes used to lure coyotes within shooting distance. These dogs are kept under control of personnel and are unlikely to interact with wildlife.
- *Detection dogs* are used to identify sites where equipment may be effective by indicating where mountain lions, bears, coyotes, or other predators have traveled, urinated, or defecated. They are kept under the control of personnel and are unlikely to interact directly with wildlife.
- *Trailing dogs* can be used to trail mountain lions, bobcat, feral swine, and black bears. Dogs can be trained to find and follow the scent of the target species. Typically the dogs are tracked with GPS collars and stay with the animal until wildlife specialists arrive and then anesthetize, dispatch, or release it, depending on the situation. Dogs are trained to ignore the scents of non-target species.

Telemetry is the monitoring of radio signals sent from a device attached to an animal to monitor an animal's movements or location. The attachment of the transmitter requires the capture and either chemical or physical restraint of the individual. The transmitter is usually a collar (in the case of mammals) or a backpack (in the case of birds). Personnel monitor the receiver on foot, in a ground vehicle, or in an aircraft.

Chemical immobilization is the use of drugs such as telazol (a combination of tiletamine and zolazepam) and ketamine/xylazine to restrain wildlife to allow for activities such as collaring and sample collection. This process can be dangerous both for personnel and the animal and requires training and experience.

These immobilizing agents produce central nervous depression through various means and render the animal unconscious. They are delivered to the target animal with a dart gun, blow gun, or syringe pole depending on the circumstances and the species being immobilized. If the agents are delivered via a dart, the dart is retrieved if possible. Often, the animal is typically treed with dogs or physically restrained by a trap and then the drug is delivered to the animal.

Once the procedures are completed the animal is monitored until it has recovered. For some of the immobilizing drugs, this means allowing the drugs to work through the animal's system. For others, there are antagonists that can be given that reverse the effects of the immobilizing drug such as yohimbine for xylazine.

4.2.4 Lethal Methods

Lethal methods are often most appropriately used by trained and wildlife specialists. Licensed firearms are often used in conjunction with non-lethal methods to attract the animal to an area or to capture the animal and hold it until personnel arrive. Methods used to attract or capture predators prior to lethal removal by firearm can include calling, trained dogs, cage traps, foot/leg snares, padded-jaw foot-hold traps, and body-grip traps.

Shooting – see description above in avian methods.

Neck snares – see description above in mammalian capture methods.

Carbon Dioxide – see description in avian methods.

Aerial WDM operations would not be carried out by CDFA/counties. Use of aircraft for WDM in California would be limited to WS-California activities. CDFA and counties may participate in this activity through cooperation or funding. Refer to Appendix C-1.

Aerial Operations. Aircraft, both fixed-wing and rotary-wing (helicopters) are used by WS-California to remove coyotes or pigs. The most frequent aircraft used for aerial shooting and hazing is the fixed-wing aircraft Piper PA-18 Super Cub and Cub Crafters CC-18 Top Cub and rotary-wing Hughes MD500. WS-California conducts aerial activities on areas only under signed agreements or federal Annual Work Plans and concentrates efforts to specific areas during certain times of the year.

Aerial shooting consists of visually sighting target animals in the problem area and shooting them with a firearm from an aircraft. Aerial shooting is species-specific and can be used for immediate damage relief, providing that weather, topography and ground cover conditions are favorable. Aerial shooting can be effective in removing offending animals that have become trap-shy or are not susceptible to calling and shooting or other methods. This method may also be used proactively to reduce local coyote predations in lambing and calving areas with a history or predation.

Fixed-wing aircraft are useful for aerial shooting over flat and gently rolling terrain. Because of their maneuverability, helicopters have greater utility and are safer over timbered areas or broken land where animals are more difficult to spot. Aerial shooting typically occurs in remote areas with low densities of tree or vegetation cover, where the aerial visibility of target animals is greatest. WS-California spends relatively little time flying and shooting over any one area.

Wildlife Services Directive 2.620 and Wildlife Services aircraft-use policy help ensure that aerial shooting is conducted in a safe and environmentally sound manner, and in accordance with federal and state laws (USDA 2020). State Directors and District Supervisors are responsible for the supervision, management, and compliance for all aviation activities within California, and all aircraft used in WS-California activities through contract, agreement, or volunteer shall have been approved by the office of the Wildlife Services National Aviation Coordinator. Wildlife Services Directive 2.615 guides all Wildlife Services shooting activities (USDA 2020). All efforts are conducted in strict compliance with the Wildlife Services Aviation and Safety Manual, the Federal Aviation Regulations, the Fish and Wildlife Act of 1956

(Airborne Hunting), any applicable State and local laws and regulations, WS-California Aviation Safety Plan, Aviation Communication Plans, and Aviation Emergency Response Plans.

Wildlife Services has an Aviation Training and Operations Center located in Cedar City, Utah. Its mission is to improve aerial operations safety and provide training and guidance for Wildlife Services aviation personnel and aerial activities. The policy and primary focus of WS-California and contract aviation personnel is ensuring well-being through safety and accident prevention efforts. Pilots and aircraft must be certified under established WS-California procedures. Only properly trained WS-California employees are approved crewmembers. Ground crews are often used with aerial operations for safety and for providing assistance with locating and recovering target animals.

Body grip traps (also known as quick-kill traps) can be used to lethally remove beaver and ground squirrels. The body-grip trap is lightweight, easily set, and consists of a pair of rectangular wire frames that close when triggered, killing the captured animal with a quick body blow. Body grip traps are lethal to both target and non-target animals. Body grip traps set for beaver may be used in both urban and rural areas and set location is used to preclude non-target animals from capture.

Snap traps are common household rat or mouse traps. These traps are often used to collect and identify rodent species that cause damage so that species-specific management tools can be applied. If an infestation is minor, these traps may be used as the primary means of management.

Gas cartridges are fumigants used to reduce burrowing wildlife damage. The cartridges are placed in the active burrows of target animals, the fuse is lit, and the entrance is then tightly sealed with soil. The gas cartridges contain two active ingredients, sodium nitrate and charcoal, and once ignited the main combustion product is carbon monoxide. The gas cartridge ingredients are stable in light and are natural plant nutrients. No secondary hazards exist with burrow fumigants because the gases rapidly dissipate (Witmer and Fagerstone 2003). If soils are too porous or too dry, too much gas escapes the burrow system before lethal concentrations are reached (Witmer and Fagerstone 2003). Use of gas cartridges would only be used by qualified wildlife specialists who have been trained to distinguish dens and burrows of target species from those of non-target species and not in occupied habitats of T&E species as per listed on label.

Euthanasia solution contains two active ingredients (sodium phenytoin and sodium pentobarbital) which are chemically compatible but pharmacologically different. Sodium pentobarbital produces rapid anesthetic action followed by a smooth and rapid onset of unconsciousness. When administered intravenously, sodium phenytoin produces toxic signs of cardiovascular collapse and/or central nervous system depression; hypotension occurs when the drug is administered rapidly. Sodium phenytoin exerts its effects during a deep anesthesia stage caused by sodium pentobarbital. Sodium phenytoin, due to its cardiotoxic properties, hastens the stoppage of electrical activity in the heart, causing a cerebral death in conjunction with respiratory arrest and circulatory collapse. Cerebral death occurs prior to the cessation of cardiac activity. This sequence of events leads to a humane, painless, and rapid euthanasia according to a manufacturer (Schering-Plough). Vet-One Euthanasia solution®, Beuthanasia®-D, and Euthasol® are regulated by the Drug Enforcement Agency (DEA) and the FDA for rapid and painless euthanasia of dogs, but legally may be used on other animals if the animal is not intended for human consumption. All carcasses would be properly disposed of to avoid secondary contact with other target and non-target species.

Physical Euthanasia methods – see description above in avian methods.

4.3 Reptilian Methods

Grid searches are performed for the purpose of locating and removing reptiles (snakes) that predate on protected ground nesting birds. Grid searches involve 1-3 personnel walking in formation a few feet apart (vegetation dependent) through an affected area to search for reptiles. Because this is performed at the request of a management agency to protect T&E species in response to reptilian predation within nesting habitat, wildlife specialists would work closely with land and resource owners/managers to ensure that this technique disturbs the protected species as little as possible. Once reptiles are located, they are captured by hand and euthanized.

Funnel traps are a conical funnel that have at least one access lid or door. The funnel trap is placed on the ground along a naturally occurring linear object or drift fencing (see below). The trap is designed to allow reptiles to enter the trap through the funnel and then confuses the animal once inside making it difficult for the animal to escape the trap. The traps are unselective, but a live mouse can be used as bait to increase their attractiveness to reptilian predators. Funnel trapping can be an efficient sampling technique, although the literature is ambivalent about the relative performance of pitfall[4] (e.g., Vogt and Hine 1982; Enge 2001) versus funnel traps (e.g., Greenberg et al. 1994; Jorgensen et al. 1998) (Ribeiro-Junior et al. 2008). When evidence of reptiles is observed, funnel traps are placed on the borders of the area to be protected to intercept foraging reptiles prior to entering the nesting area.

Tube traps are long cylindrical tubes of PVC or clear rigid plastic tubing capped at one end. Tube traps are usually used in concert with drift fencing. Tube traps are typically not baited. When evidence of reptiles are observed, tube traps are placed on the borders of the area to be protected to intercept foraging reptiles prior to entering the nesting area.

Drift fencing acts as a vertical barrier that blocks the movement of animals across the landscape. There are multiple variations of drift fencing dependent on habitat and target species, it can use plastic mesh or netting attached to wooden stakes. Drift fencing typically guides animals toward a pitfall bucket, funnel trap, or other capture device (Willson and Gibbons 2009). Drift fencing is effective in capturing reptiles. Drift fencing could be used on the outside of a colony or nest area to intercept reptilian predators attempting to access the area.

Physical Euthanasia methods – see description above in avian methods.

4.4 References

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[4] Pitfall traps can be used along drift fences, where target predators fall into a buried pit (container).

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