A Habitat Harmony Handbook

A Non-Lethal Management Guide for Gunnison's Prairie Dogs

Habitat Harmony, Inc.

"Walking in Harmony with Wildlife"

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By Habitat Harmony, Inc.

October 2018

Habitat Harmony, Inc. is a tax-exempt, nonprofit corporation founded upon the recognition of the inherent value of the natural world. Our mission is to work toward a sustainable, healthy future for the native wildlife and natural habitats of northern Arizona. Our focus has been the prairie ecosystems of northern Arizona with emphasis on protecting prairie dogs, an important keystone species.

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About this Handbook

Gunnison's prairie dog (*Cynomys gunnisoni*)—a native to the Four Corners region—is a keystone species whose burrowing and feeding habits keep prairie grasses healthy and help rainwater infiltrate deeply into the soil. Prairie dog burrows provide shelter for other species like burrowing owls, small mammals, snakes, lizards, and invertebrates. Prairie dogs are an important food source for many animals including hawks and the endangered black-footed ferret. Despite all their benefits, their burrowing and foraging can be, or perceived to be, incompatible with certain human land uses.

This handbook is a summary of humane, non-lethal methods for removing prairie dogs and preventing future colonization by using barriers. The methods described in this handbook have been developed by professionals with extensive knowledge of prairie dog natural history and hands-on experience helping landowners to create spaces free of prairie dogs. Methods are substantiated, but not scientifically proven, by the experiences of those interviewed. This handbook is an effort to provide a compilation of the best information currently available.

DISCLAIMER: Impacts to non-target species that use prairie dog burrows (other rodents, birds, reptiles, amphibians, and invertebrates) should always be taken into consideration before any management action is taken. Consult with your regional or state wildlife agency for local regulations and other species that may be protected and potentially harmed.

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Introduction 1

A. Purpose of This Handbook

Flagstaff, Arizona, like many towns and cities in the Western U.S., was built on prime Gunnison's prairie dog habitat. Only remnants of their once expansive colonies remain in narrow easements, strips of green space, and on undeveloped parcels of private and public land. The resultant close proximity of human habitation to prairie dog colonies has led to conflict. Despite all their benefits, their burrowing and foraging can be, or perceived to be, incompatible with certain human land uses.

The good news is that it is possible to live alongside prairie dogs and enjoy landscaping and gardens without resorting to lethal means to control them.

Habitat Harmony, Inc., a Flagstaff-based non-profit organization that helps people live in harmony with wildlife, receives many calls from people seeking non-lethal ways to create or maintain a space free of prairie dogs on their property while allowing these wonderful animals to continue to thrive in an adjacent colony. These animals are delightful to observe. They live in close-knit family groups and help to maintain the integrity of the ecosystem we share with them.

This handbook will assist you to find humane and non-lethal methods to reduce or eliminate prairie dog activity. You can also use these methods to temporarily move prairie dogs from an area during short-term projects like landscaping or driveway repair. Living in the vicinity of prairie dogs can be a positive experience. Their colonies provide great wildlife viewing opportunities, and their social behavior can be very entertaining.

The methods described in this handbook have been

developed by professionals with extensive knowledge of prairie dog natural history and hands-on experience helping landowners create spaces free of prairie dogs. There is little information available that is based upon documented, peer reviewed scientific research covering this subject. The individuals we consulted in developing this handbook are knowledgeable, but every situation is unique therefore we cannot guarantee results. This handbook presents methods substantiated, but not scientifically proven, by the experiences of those interviewed. It is an effort to provide a compilation of the best information currently available.

B. Gunnison's Prairie Dog

The Four Corners region of northern Arizona, southwestern Colorado, northwestern New Mexico, and southeastern Utah is home to Gunnison's prairie dog (*Cynomys gunnisoni*), one of five species of highly social, colonial, burrowing ground squirrels.[1] Up to several hundred individuals can live in

E. Renn

one colony, organized into small family groups. Gunnison's prairie dogs live about four to six years and they are slow reproducers.[2] Adult females bear one litter of three to five pups per year. Less than half prairie dog pups survive their first year.[3] Gunnison's prairie dogs hibernate from approximately October to March each year with the timing varying with elevation and weather.

Prairie dogs are a *keystone species* - a species essential within an ecosystem that when removed, changes the ecosystem drastically.[4] Their burrowing and feeding habits keep prairie grasses healthy for other grazing animals.[5] Their burrowing helps rainwater infiltrate deeply into the soil. Burrows provide shelter for other species like burrowing owls, small mammals, snakes, lizards, and invertebrates. Prairie dogs are an important food source for many animals including hawks and the endangered black-footed ferret.[6] Gunnison's prairie dogs communicate through physical contact and complex vocalizations.

Identifying prairie dogs and their burrows is relatively simple. Adult Gunnison's prairie dogs are buff colored animals with a relatively short and light-tipped tail and

brown eyebrows. They range from 12 to 15 inches long and between 1.5 to 2.5 pounds (A). A prairie dog burrow is an opening to a system of tunnels. Entrances range between four and eight inches in diameter and are typically, but not always, located within or adjacent to a larger mound (A). Pocket gophers are solitary animals that are rarely seen above ground and their dirt mounds seldom have entrance holes typical of prairie dog burrows (B, C). Prairie dogs and their burrows are significantly larger than pocket gophers and their burrows. Prairie dogs may also be confused with other squirrels including rock squirrels (D) that may temporarily occupy a vacant prairie dog burrow and the round-tailed ground

***A.** Gunnison's and burrow*

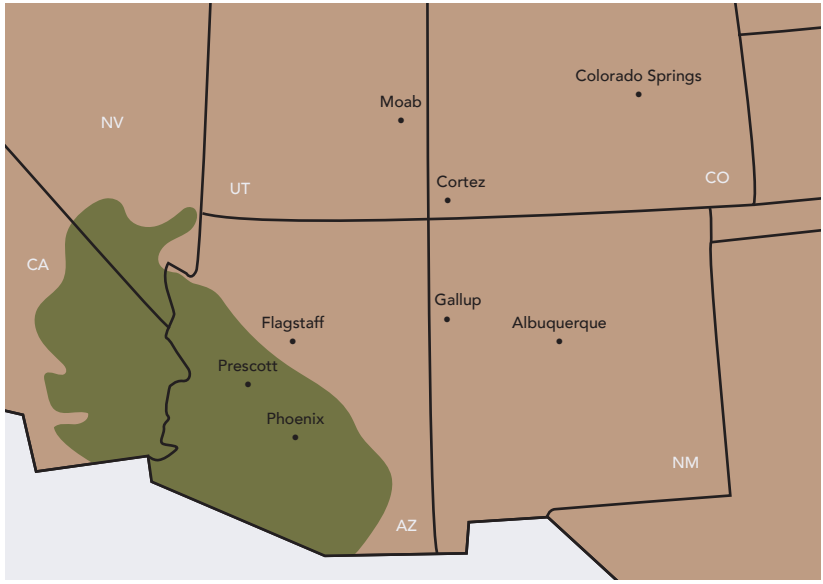
***B.** Pocket gopher and burrow*

***C.** Above ground view of pocket gopher excavation*

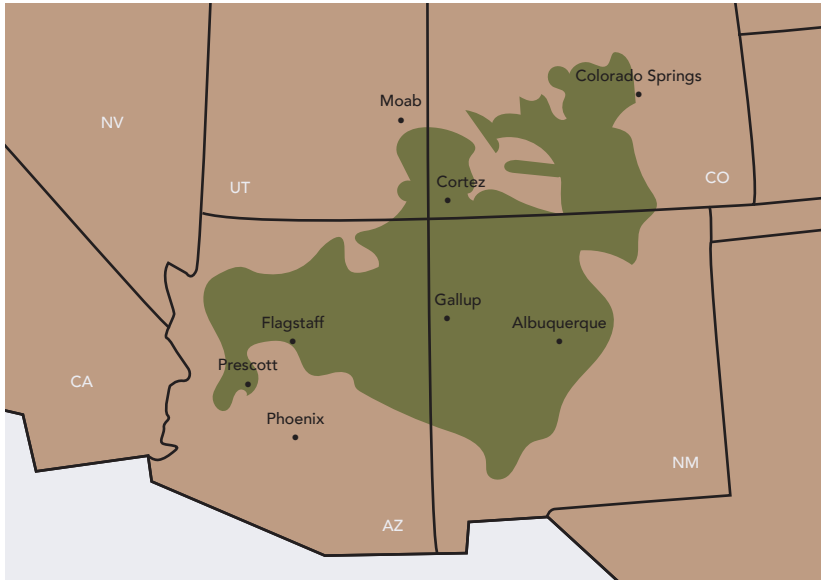
***D.** Rock squirrel*

***E.** Round-tailed ground squirrel*

squirrel (E) which dig burrows but are smaller than prairie dogs. Range maps may help you determine if you are dealing with round-tailed ground squirrels (F) or Gunnison's prairie dogs (G).



F. Round-tailed ground squirrel range map [7]



G. Gunnison's prairie dog range map [8]

C. Gunnison's Prairie Dog: Current Status and Conservation Concerns

Gunnison's prairie dog populations have decreased by more than 95% over the last century due to pressures from habitat loss, disease, recreational shooting, and hunting.[9,10] Currently, the biggest threat to prairie dog colonies is *sylvatic plague*,[11] which primarily affects rodents and other wild animals. The same bacterium that causes *sylvatic plague* can cause a variety of plague in humans (See Appendix A for details). This disease, which is transmitted by a non-native introduced flea, can result in prairie dog colony mortality rates of more than 99% during an outbreak.[12,13,14] This in turn, poses a threat to species like the federally endangered black-footed ferret which rely on prairie dogs as prey.[15]

Gunnison's prairie dog is considered a Species of Greatest Conservation Need in Arizona, New Mexico, Colorado and Utah.[16,17,18,19] After a petition to list Gunnison's prairie dog under the Endangered Species Act was denied in 2006, an interstate conservation assessment was carried out followed by the development of a Gunnison's prairie dog conservation plan.[10,20] Arizona then developed the *Interagency Management Plan for Gunnison's Prairie Dogs in Arizona*[21] which:

- Identifies the minimum number of active acres to be maintained in Arizona (108,353 acres);
- Requires maintaining prairie dog populations across 75% of their historic range;
- Directs monitoring incidence of plague and threats to habitat; and
- Requires development of a mitigation program for urban prairie dogs, which may include educating urban landowners about prairie dogs, so that more informed decisions about control can be made.

This book was written in part to meet mitigation and education program elements within the Interagency Management Plan.

Effective Non-Lethal Options to Manage Prairie Dogs on Your Property

2

The good news is that you can protect your property without killing prairie dogs. This handbook offers methods to deal with two basic scenarios: preventing prairie dogs from expanding to your property in the first place and removing prairie dogs from all or part of your property and keeping them from moving back in.

A. Scenario One: If No Prairie Dogs Are Presently on Your Property

If prairie dogs are on adjacent property and have not yet expanded onto your land, you may want to act preemptively to avoid eventual colonization. Leaving native vegetation such as rabbitbrush in place on your lot can be key to discouraging colonization by prairie dogs. The less clearing of the land, the better chance it will remain prairie dog free.

Preemptive actions also include creating a *visual* or a *physical* (solid) barrier between all or part of your property and the colony. A visual barrier is typically a swath of dense vegetation such as Arizona wild rose (*Rosa woodsii var. ultramontana*) that prevents prairie dogs from seeing through it. Visual barriers can deter prairie dogs—they are less likely to move into an area they are unable to see through—but may not be entirely effective on their own. Using a physical barrier (e.g., solid fence, wall) with no gaps or openings through which prairie dogs can move improves the odds of keeping prairie dogs out. If you wish to protect only a select area from burrowing and can tolerate the prairie dogs moving across the protected area, you might consider *hardscaping* (see E, page 10).

B. Scenario Two: If Part of a Prairie Dog Colony Extends onto Your Property

If prairie dogs are currently on your property, you will need to determine if you want to remove them entirely or if you want to create a prairie dog free zone for a garden, playground, or special use area within the property. If you choose the latter and can tolerate the prairie dogs moving across the protected area, you might consider *hardscaping* (see Section E page 10). If you want to remove prairie dogs entirely from a space, there are two approaches: passive and active translocation. *Translocation* is the human-mediated movement of living organisms from one area, with release in another.[22] The terms translocation and relocation are used interchangeably in this handbook.

NOTE: Any removal will require constructing a barrier to keep prairie dogs from moving right back in.

C. Removing Prairie Dogs with Reverse Dispersal Translocation™ (RDT)

We recommend passive translocation using Reverse Dispersal Translocation™ (RDT), a non-lethal management tool that causes prairie dogs to relocate themselves to a part of the colony where they can be tolerated, without directly handling them. In essence, you create a one-way door over each burrow that allows prairie dogs out but not back in. Over time, they abandon these burrows. RDT works to reshape the colony so it does not intrude where it is not wanted, but will not totally eliminate the colony. It is preferable to active translocation because it is less expensive, less labor intensive, may not require permitting (check with local authorities), and does not require transporting animals to a separate receiving colony.

The method was developed by Pam Wanek and has been used to effectively remove prairie dogs on hundreds, perhaps thousands, of burrows in developed neighborhoods

and parks, public land project sites, commercial office parks, parking lot medians, building expansions, utility installations, athletic fields, trail expansions, detention pond dams, and roadway construction.[23,24,25,26,27,28] RDT saves prairie dogs and maintains the integrity of their colonies while preventing inhumane deaths and environmental contamination that can result when poisons are used.

Any able bodied person who follows the provided directions carefully should be able to successfully use RDT.[29] See Part Four and Appendix B for additional background and step-by-step methods.

D. Removing Prairie Dogs through Active Translocation

Coexistence is the first choice when dealing with prairie dogs. When that is not feasible, active translocation is one possible choice. Active translocation is a process requiring the human handling of prairie dogs. ***Please do not attempt to live trap and translocate prairie dogs on your own because they are unlikely to survive.*** It must be implemented by permitted practitioners and requires capture and then release to an approved translocation site. Approval from city, county, and/or state agencies, such as the Arizona Game and Fish Department, must be obtained. Active translocation should only be considered when all other options have been eliminated. If you are considering a translocation please see the Habitat Harmony website (*https://habitatharmony.org*) for information on obtaining professional assistance and the required permits.

E. Maintaining Areas Free of Prairie Dogs with Barriers and Hardscaping

When permanent removal is the goal, a barrier must be constructed to inhibit prairie dog movement back into the area. The barrier type you choose will depend on the size of

the selected area, acceptable level of ongoing maintenance, budget considerations, and cost effectiveness of the various designs. Aesthetics may also be a consideration when choosing barrier materials.

Hardscaping is an alternative to conventional fence-type barriers. *Hardscaping* is designed to protect an area from burrowing while allowing prairie dogs to move across it. *Hardscaping* can involve installing impermeable barriers like paving stones or flagstone; laying hardwire cloth on bare ground and adding six to eight inches of mulch (e.g., in tree wells); or removing the top six to eight inches of soil in garden areas, installing a horizontal barrier of hardwire cloth, backfilling, and then planting the area.

Barrier design (except when *hardscaping* or using a visual barrier) must include *skirting*, or *trenching,* or a combination of both. Skirting is when you lay down a barrier material at least three feet horizontally on the ground along the entire length of the barrier with a one foot lip secured vertically to the barrier. Trenching involves digging a narrow trench at least three feet deep along the entire length of the barrier, inserting barrier material, refilling the trench with soil, and tamping down well to discourage future digging. In rare cases, even using both a horizontal barrier and trenching has proved insufficient to completely inhibit breaching.

Creating a *buffer zone* free of prairie dogs at least 15 to 20 feet wide between the barrier and the adjacent colony is recommended when possible. The buffer is ideally established as part of the initial RDT or translocation and maintained by doing regular checks and immediately implementing RDT to eliminate any new burrows. Steve Zimmerman, retired Flagstaff Parks Manager, suggests that 60 feet is the preferred minimum buffer width. This is often not practical on small lots. There has been success on some sites even when buffers were not established.

See Appendix C for background, materials, and methods.

Determining the Best Plan for You

3

To determine the best way to manage prairie dogs on your property, you must first determine what level of coexistence you consider acceptable. The flow chart below may be used to determine the method that is best suited to your needs.

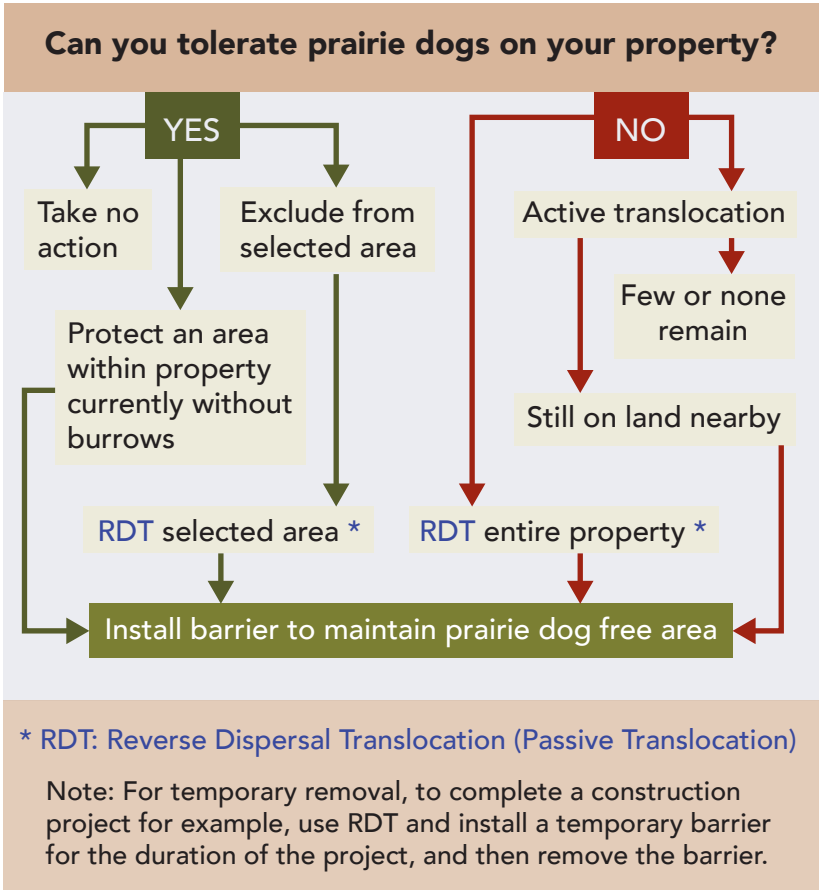


Figure 1 - *Use this flowchart to help determine the best solution for you. Source: R. Rauch*

4 Using Reverse Dispersal Translocation™ (RDT) to Relocate Prairie Dogs

A. RDT Can Be Used in A Variety of Situations

- To remove prairie dogs from areas where their presence is unacceptable.*
- When prairie dogs have recently arrived on your property and you want to keep them from getting established.
- To temporarily move prairie dogs from an area where you plan to do construction, e.g. a driveway or walkway.

** NOTE: If you are considering RDT for a location where prairie dogs may be pushed off your property onto a neighboring property, communication and coordination with the neighbors is encouraged and may be legally required before RDT methods begin.*

B. Timing

Timing is of the utmost importance. RDT is best performed after stressors such as breeding and birthing have passed—July through mid-September in Arizona. Timing may vary in other states. The exception to this timing guideline is *single dispersers* which should be moved immediately, except in inclement weather. *Single dispersers* are individual prairie dogs that dig burrows that seem to pop up out of nowhere. Every RDT project is unique, but in many cases, burrows can be closed off in a time frame of one week to one month.

C. General RDT Guidelines

- The area to be vacated must have an adjacent colony that is significantly larger than the area to be closed off.
- All burrows subject to removal must first be identified with a flag or wooden stake with unique label identification.
- Burrows must be monitored daily during the process with activity documented in field notes (See Figure 2 and Appendix E).
- A burrow must be inactive for at least 72 hours before backfilling (closing) the burrow.
- Prairie dogs are known to naturally plug their own burrows to: keep out cold drafts, protect young, and avoid predators. In some cases they will plug burrows you are working on! Eventually they will unplug these burrows and you will need to treat them.
- Strictly follow the protocols (Appendix B) and keep detailed notes (Figure 2 and Appendix E) on the activity at each burrow according to protocols.

D. Two Strategies

Pam Wanek has developed two strategies for RDT—***The Roll*** and ***Part the Sea***. Your situation will determine which strategy you use but the steps for RDT will be the same for each. See Appendix B for additional background and step-by-step instructions.

The Roll closes prairie dog burrows gradually and progressively in the area where prairie dogs are not wanted. This will force prairie dogs to relocate beyond where the new barrier will be installed. Burrows within at least 15 to 20 feet on the prairie dog side of the barrier are also closed to create a buffer zone that inhibits prairie dogs from using tunnels that extend under the barrier.

Part the Sea clears prairie dogs from an area temporarily while a project such as a pathway or utility installation is underway. A temporary barrier is erected and prairie dogs are allowed to return once the project is completed.

Remember that all RDT will require installation of barriers to keep prairie dogs from moving right back in, whether it is a temporary or permanent removal.

See Appendix B for step-by-step instructions.

Burrow #	Start Date/Time	Check Date/Time	Notes on Activity
1	9/1 11 am	9/1 7 am	No Activity
		9/2 8 am	Sticks Moved, Replace them
		9/3 8 am	No Activity
	Close Date/Time	9/4 8 am	No Activity
	9/6 9 am	9/5 9 am	No Activity
		9/6 7 am	No Activity
Burrow #	**Start Date/Time**	**Check Date/Time**	**Notes on Activity**
2	9/1 11 am	9/1 7 am	No Activity
		9/2 7 am	No Activity
		9/3 7 am	Sticks Moved, Replace them
	Close Date/Time	9/4 7 am	Sticks Moved, Replace them
	9/7 11 am	9/5 7 am	No Activity
		9/6 7 am	No Activity
		9/7 7 am	No Activity

Figure 2: *Burrows must be monitored daily during the process with activity documented in field notes.*

Barrier Installation Following Prairie Dog Removal to Inhibit Colonization

5

Once prairie dogs have been removed from the designated area, you must ***immediately*** install a barrier to prevent them from returning. Barriers can be constructed of various materials and can be permanent (e.g., skirted and/or trenched fences, *hardscaping*, or vegetation) or temporary (e.g., silt fence or straw bale). If you require a permanent barrier but are unable to install it immediately after removing prairie dogs from your property, you must still put up a temporary barrier.

Minimum Requirements for Physical Barriers

- The barrier should be at least three feet tall and not be climbable, especially on the side of the barrier facing the prairie dog colony.
- There must be no light visible between the barrier and the ground as this is the area most vulnerable to breaching. Even if the area allowing in light is not itself breachable, the fact that prairie dogs see the opening may motivate them to find a way in. You can add soil, stones, or metal landscape edging along the bottom to keep light from passing through.
- Consider if the permanent barrier will block or impede drainage from the property before installation.
- All permanent barriers must extend either at least three feet below ground using metal (solid or ⅛-inch hardware cloth) or extend at least three feet horizontally along the base on the prairie dog side using ⅛-inch hardware cloth or a layer of six to eight inch cobble. There is some debate over whether inserting a material such as hardware cloth to extend the barrier several feet below

ground or using a horizontal barrier of hardware cloth or rocks along the base are equally effective at preventing burrowing into the protected area. There have been successes and failures with both methods.

- Monitoring for any prairie dog activity must continue after the initial translocation and barrier installation to ensure that the system is working effectively. If prairie dogs are finding a way inside the protected area you must determine how the barrier is being breached and immediately make repairs or adjustments. Use RDT on any burrows that develop on the protected side and in a buffer area on the prairie dog colony side to stop reestablishment.

If a barrier is properly maintained and if the protected area is monitored regularly, there will be a higher level of success. ***No barrier has been found to be 100% effective***.

This metal fence barrier was installed between a park and a prairie dog colony and has proven effective in prohibiting prairie dogs from entering the protected area.

Vegetative Barriers

Vegetative barriers are considered visual, not physical (solid) barriers. Because barriers must be erected immediately following RDT, it can be very expensive to install plantings that are both tall and wide enough to be an effective deterrent.

Vegetative barriers alone or in combination with fencing were found by many to not be adequate for a variety of reasons.[30,31] However, Pam Wanek has had success with vegetative barriers that are dense, wide, and aromatic. She has found that a diverse mix of shrub row barriers (e.g., junipers, rabbitbrush, skunkbrush, and big western sage) at least eight feet wide up to 20 feet or more are very effective. She recommends a blend of species for resilience to disease.[32] Ghia Zalewa advises that an effective barrier should be dense and at least three to four feet wide.[33]

If it is cost prohibitive to erect a permanent physical barrier, dense hedges of rapidly growing shrubs such as wild rose (*Rosa woodsii*) can be paired with temporary barriers (e.g., straw bales), which can be removed once the hedge is established. Arizona wild rose (*Rosa woodsii var. ultramontana*) combined with a chain link fence was also credited with slowing prairie dog movement into protected areas.[34]

More research is needed to determine what factors contribute to vegetative barriers' success or failure.

See Appendix C and https://habitatharmony.org for more detailed information on a variety of barrier options.

Appendices

APPENDIX

A

Prairie Dogs, People, and Plague

The following fact sheet has been adapted from, ***Prairie Dogs, People and Plague****, a report compiled by The Prairie Dog Coalition.*[35]

Plague is caused by a bacterium (*Yersinia pestis*) and is easily transmitted by infected fleas and animals. The disease was accidentally introduced to North America from Asia around 1900, and has devastated wildlife populations across the West. Many rodent species are susceptible to plague, and all four species of prairie dogs in the U.S. are extremely susceptible. Because the prairie dog ecosystem has been destabilized by massive plague die-offs, other wildlife that rely on prairie dogs for food and shelter including the black-footed ferret, burrowing owl, ferruginous hawk, and mountain plover, are also facing population declines. Researchers are working to develop a vaccine against this non-native disease.

In stark contrast to being reservoirs of plague, over 95% of infected prairie dogs die within ***78 hours of infection***. Because of this, prairie dogs can be an indicator species for the presence of plague circulating in other rodent species in an area. The loss of a prairie dog colony over the course of a few days or weeks (in absence of human control) strongly indicates the presence of plague. If you see an active prairie dog colony it is reasonable to assume plague is not present in that colony.

Plague is a rare disease among humans, averaging seven cases per year in recent decades across the US.[36] The Centers for Disease Control states that, "The number of human plague infections is low when compared to diseases caused by other agents, yet plague invokes an intense, irrational fear, disproportionate to its transmission potential in the post-antibiotic/vaccination era." Fears of humans contracting plague from prairie dogs are often exaggerated and

sometimes even used as an excuse for extermination.

Roughly half of U.S. plague cases occur in New Mexico, with a total of 50 reported cases since 2000.[37] In comparison, Arizona had only five known cases of human plague in that same period.[38] According to the Colorado Department of Public Health and Environment statistics, of the 51 plague cases in Colorado since 1957, only seven cases, including one fatality, were directly linked to prairie dogs. Of those seven cases, two were related to people skinning prairie dogs, two were the result of family pets bringing home fleas after being allowed to roam freely in prairie dog colonies and three were people infected from working, playing, or hiking in infected colonies.

The Colorado Department of Health states, "If precautions are taken, the probability of an individual contracting plague, even in an active plague area, is quite low." Eric Stone, wildlife biologist for the US Fish & Wildlife Service at Rocky Mountain Arsenal National Wildlife Refuge confirms, "Contracting the plague is very unlikely even if a person is walking through or living near a prairie dog colony. The fleas that carry plague stay in and around the burrows, so as long as a person or their pets are not coming in contact with the fleas, it is unlikely that they will contract plague."

The most common means of human infection is from being exposed to rodent fleas in areas where rodents are dying from plague. Pet cats and dogs have also been implicated in human cases by bringing home infected fleas or in the case of cats contracting plague by catching and eating infected animals or by being bitten by infected fleas. Even though the risk of human infection is low, people working in or near prairie dog colonies should be familiar with the symptoms of plague.[39] Plague can present like many other illnesses, and fever is a common symptom. After any potential exposure, monitor closely for a fever. If detected, seek treatment right away. Plague is easily treatable with antibiotics and readily curable in humans IF diagnosed and treated early.

RECOMMENDED CONTROL AND PREVENTION

- Dusting rodent burrows with insecticide powder to kill fleas is effective in controlling plague in relatively small areas that have high human use, such as a colony bordering a park, open space, or subdivision. In these cases, a 100-foot buffer zone of burrows can be treated with insecticide dust and the areas posted to advise people and pets to stay out of the colony.
- Avoid contact with all sick and dead rodents and rabbits. Report any die-offs involving multiple rodents (as opposed to a single dead animal) or the sudden disappearance of a prairie dog colony to local or state health departments.
- Keep cats and dogs out of prairie dog colonies. This will continue to decrease the low number of human cases of the plague linked to prairie dogs. Pets that live in or visit rural areas should be treated for fleas according to your veterinarian's recommendations.
- Do not feed or entice any rodent or rabbit species into your yard, back porch, or patio.
- Eliminate rodent habitat, such as piles of lumber, broken cement, trash, and weeds around your home or cabin.
- While hiking, treat pants, socks, shoe tops, arms, and legs with insect repellants.
- Remember the incubation period of two to six days and consult a physician if sudden unexplained illness occurs within that period after activities in the outdoors.

NOTE: Large-scale rodent extermination, such as poisoning entire prairie dog colonies, is NOT recommended as an effective means of plague control. Without these animals as available hosts fleas will be looking for new hosts, which increases the risk to humans.

APPENDIX

B

Reverse Dispersal Translocation™ Step by Step

IMPORTANT NOTE: The following instructions use one-inch poultry (chicken) wire and were developed for large scale projects where ease of cutting and cost are important considerations. Habitat Harmony suggests using small mesh hardware cloth to reduce unintended harm to snakes, lizards, reptiles, and other small animals, as well as for increased durability. If you are concerned with accidentally killing non-target animals use ⅛-inch hardware cloth. Anything larger is dangerous to small-bodied snakes and lizards.[40] *If cost is a concern, then using ¼-inch hardware cloth poses less risk than one-inch poultry wire, but may result in entrapment of small animals. We recommend inspecting exposed wire cloth of any size on a daily basis. Be prepared to cut out any entrapped animals until the wire has been thoroughly covered over with dirt or removed at project completion.*

A Passive Prairie Dog Translocation Method Developed by Pam Wanek

1. RDT is a habitat based method that manipulates the burrow system causing prairie dogs to leave conflict burrows.

2. In RDT, prairie dogs are not handled; instead they must acclimate themselves into territories with pre-existing burrows.

3. RDT requires access to an existing active colony that is connected to **and** substantially larger than the removal area.

4. In most cases, barriers (physical structures or vegetative) should be employed **after** all prairie dogs are removed.

5. RDT is best used after biological stressors such as breeding, birthing, and pup rearing have passed and when **overall** population densities are lower thus

reducing competition for limited resources. These periods of time may vary from state to state and species to species. For example, in Colorado RDT is best used from mid-August through mid-November for black-tailed prairie dogs and August through mid-September for Gunnison's prairie dogs. In Arizona, July through mid-September is a good time to move Gunnison's prairie dogs. Other factors such as hibernation, torpor, and poor weather conditions should be considered. *Single dispersers* should always be relocated immediately upon discovery. See page 12 for more on *single dispersers*.

6. RDT is useful for: building and road expansions, utilities installations, solar arrays, removal from developed neighborhoods, parks, athletic fields, commercial building areas, dams, barrier maintenance, revegetation, in conjunction with active relocations, and to control colony expansions (for example, burrows expanding into neighboring yards, commercial areas, or parks).

7. Non-target species impacts should be considered for any alteration of prairie dog burrows.

8. In practice the process can take anywhere from one week to one month depending on the site involved.

9. If spring construction is likely, RDT should be performed during the recommended periods of time and then periodically monitored throughout the season and up to and sometimes during the construction project (please see #5 in this list).

10. If proper guidelines are followed, RDT can be employed by any able bodied person. However, project difficulty varies on a site by site basis. Any site that involves over 10 burrows should be reviewed first by someone that is either trained in the technique or has a solid working background with prairie dogs.

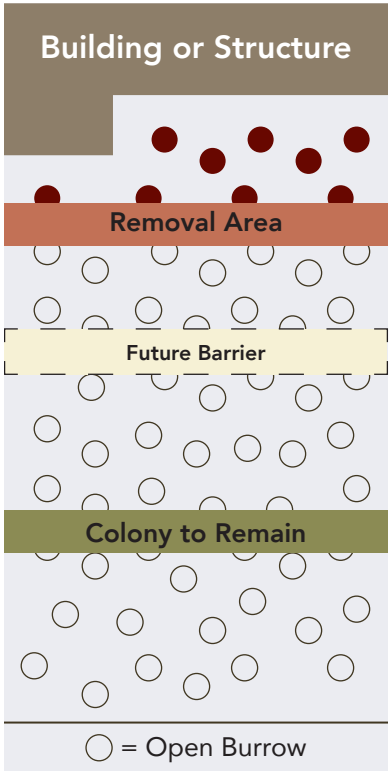
11. There are two types of RDT: ***The Roll*** and ***Part The Sea***

The Roll

The Roll is used when prairie dogs need to be permanently excluded from an area. In this case prairie dogs are gradually "rolled" out of the conflict area using the process described below, and acclimated into the acceptable area. Rolling may require several stages.

Note: for large conflict areas, prairie dogs must be progressively rolled to discourage them from reopening originally closed burrows.

Stage 1



Progressively begin closing burrows farthest away from the receiving prairie dog colony.

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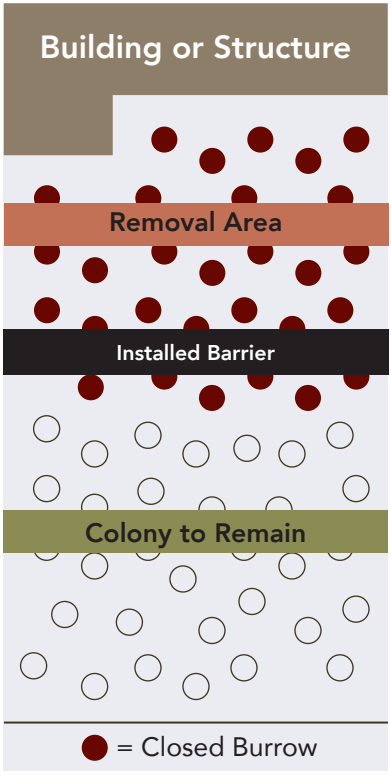
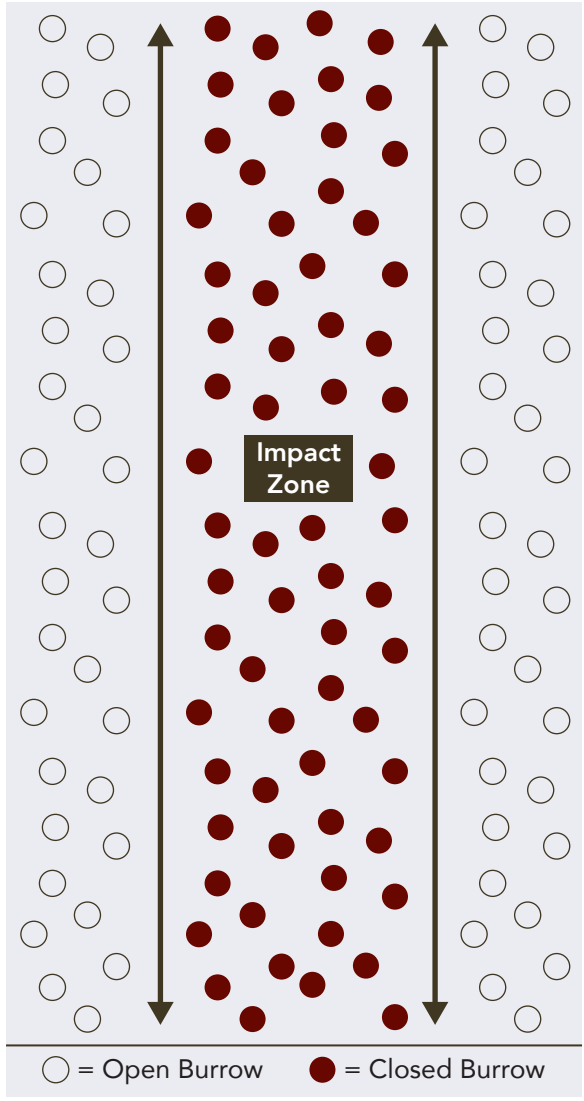
Stage 2



Close all burrows to 15 feet past barrier to discourage prairie dogs from going through underground tunnels. Install barrier.

Part The Sea

Part The Sea is useful for moving prairie dogs during temporary impact projects such as: construction, maintenance of utility lines, trails, or solar energy arrays. Close burrows within entire construction footprint. In some cases a temporary barrier (black silt fence or other) may need to be installed to keep prairie dogs away from the impact zone.



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Equipment Required

- a cart to carry equipment
- shovel
- two-foot-wide one-inch poultry (chicken) wire
- metal baseball bat
- a garden hose marked off in one-foot increments (for measuring burrows)
- hammer
- box cutter
- spring loaded tin snips (to cut poultry wire)
- bamboo skewers
- six-inch sod staples or larger
- softball sized rocks
- duct tape
- single flap four-inch diameter dryer vent
- four-inch diameter corrugated tube
- bucket (for hauling equipment)
- flags or wooden stakes to mark burrows

Step #1: Cut wire

A. Anchor one end of two-foot-wide one-inch poultry wire, roll out wire and anchor other end with sod pins:

B. Using spring loaded tin snips, cut directly down the middle of the poultry wire seam:

C. Overlay one long cut piece directly over the other and secure both ends:

D. Cut two 12-inch wire pieces at a time (use your foot to prevent recoiling):

E. Stack cut squares:

Step #2: Set Up Wire Door

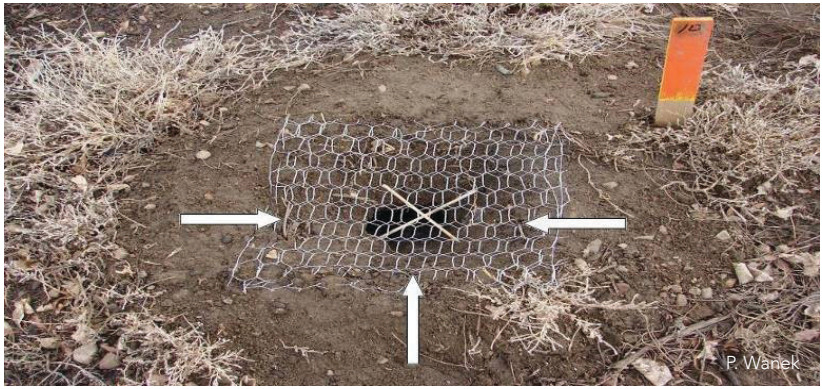
A. To monitor burrow activity, wedge two sticks in a crossed position roughly three inches below burrow surface (use more sticks if the burrow is wider than four inches:

B. Place two pieces of cut wire together (match curve pattern and seams). Notice curvature in wire pieces. Place wire over burrow entrance where curvature faces outward from burrow and covers the entire burrow opening.

C. Check tension on wire door. Hold the bottom of the wire against the burrow entry point with one hand and with the other hand slightly pull up on the top of wire (top of burrow). Release the top of the wire square. It should snap down over burrow:

D. Secure wire square to soil with sod pins at entry point of burrow and each side of the burrow. Leave the top of the wire square unattached (this is where the prairie dog will exit):

E. Mark each burrow with a flag or wood stake (preferred for long-term projects) labeled with a unique number. The finished product should look like this. Crossed sticks three inches below burrow surface, wire door placed over burrow and held in place by one sod staple at arrow points:



F. Adding a softball sized rock at the burrow entrance further impedes the prairie dog from digging under the wire to regain access. The rock will be used later to close the burrow:

Step #3: Monitor burrow activity

Burrows should be monitored daily for stick activity. If the sticks have moved, then replace and monitor again. If sticks have not moved for 72 hours, then close the burrow.

Note: the 72 hours is necessary to ensure apprehensive prairie dogs challenge the stick and wire rather than just moving the sticks. Inclement weather may prolong waiting period.

Step #4: Close Burrow

A. Remove all wires, then dig back from tunnel entrance at least six inches deep below soil line:

B. Using a bat and hammer, backfill tunnel with soil eight-inches below soil line:

C. Mold one cut square of wire around bat:

D. Insert bat with wire into tunnel. Hammer to secure the wire in tunnel. Remove bat to leave the wire in place. Place rocks and soil inside molded wire and tamp down firmly:

E. Flatten wire above ground to form a skirt and anchor with five to six 6-inch sod staples:

F. Install second wire over newly closed burrow and anchor using five to six 6-inch sod staples. This wire should be removed or buried after project completion:

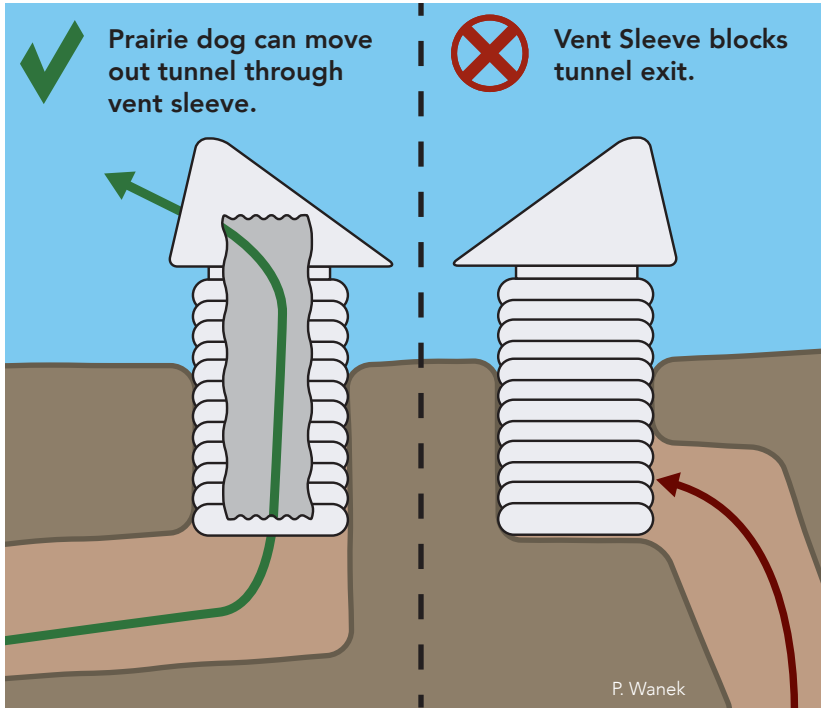
Step #5: Dryer Vent

In rare cases, using wire doors to deactivate burrows may become difficult and a modified dryer vent application may be necessary.

Equipment : single flap four-inch diameter dryer vent, four-inch diameter black corrugated tube, duct tape, one-inch netting poultry wire, sod staples, box cutter, hammer, shovel.

A. Determine the length of the black tube: The tube should be long enough so it is tightly wedged within the interior wall of the tunnel, thus forcing the prairie dog to use the black tube rather than move between the tube and tunnel wall. Make sure the tube configuration does not block off the tunnel (see diagram below). After determination of below ground length add about eight inches, so when installed the black tube extends eight inches above soil line. This step is necessary so the prairie dog cannot reopen flap door at ground level. Cut the black tube with a box cutter and install tube into tunnel. This may require twisting the tube for a snug fit.

Proper vent installation:



B. Remove manufactured sleeve from the collar of the dryer vent and replace it with the black corrugated tube. Duct tape may be needed on collar to ensure a snug fit. Affix the vent and tube together with duct tape:

C. Cut one two-foot by two-foot square of one-inch poultry wire to use as a skirt at the base of the tube configuration. Cut a hole in the middle of the skirt for black tube opening. Secure skirt to ground with six-inch sod staples at the base of black tube and skirt edge (see black lines) to prevent the prairie dog from digging back into the tunnel.

Use a stick to prop the flap lid of the dryer vent slightly open so there is light at the end of the tunnel to provide the prairie dog with visual directions to exit the tube. Position the stick so it moves as prairie dogs leave the tube:

D. Monitoring should occur daily so you can take notes to track activity. Dryer vents may take longer to evacuate simply because the apparatus is foreign to the prairie dog. In some cases the prairie dog may peer out of the flap without fully emerging. If the stick moves, reset and monitor until there is no activity for at least four days. After 100% certainty that prairie dogs are gone, remove vent and wire skirt, and cut back black tube to ground and fill in with rocks and soil.

Prairie dog's emergence.

Full emergence, see two prairie dogs.

Stick moved; reset and monitor for four additional days.

Step #6: A Chart for monitoring

For large projects using a chart to indicate progress is helpful; it may also be shared on Google Spreadsheets.

Site Name: ACME PROJECT 2008										
Date	15-Sep	16-Sep	17-Sep	18-Sep	19-Sep	20-Sep	21-Sep	22-Sep	23-Sep	24-Sep
Temp	60	60	70	75	80	65	75	80	60	70
Time	10:30 AM	10 A.M.	10 A.M.	12 P.M.	3 P.M.	10 A.M.	11 A.M.	3 P.M.	10 A.M.	11 A.M.
Stake #1	WS	WAS	WAS	WIS	WIS	WIS	C	C	C	C
2	WS	WAS	WAS	WIS	WIS	WIS	C	C	C	C
3	OAR 1	S	AS	WS	WAS	WIS	WIS	WIS	C	C
4	S	AS	AS	WS	WAS	WAS	WIS	WIS	WIS	C
5	S	WS	WAS	WAS	WAS	WAS	VS	VAS	VIS	VIS

Legend: W=wired, S=Sticked, A=Active, I=Inactive, C=Closed, OAR = Open Active Receiving Burrow, V=Vent

Note: #5 the wire is replaced with a dry vent.

P. Wanek

Step #7: Final Notes

Successful passive relocation requires looking from the prairie dog's point of view. Is there a sufficient number of existing burrows in the receiving adjacent colony? Is the timing within the recommended window–after the young are mobile, populations are lower (naturally) and before hibernation?

APPENDIX

C

Prairie Dog Barriers Overview

IMPORTANT NOTE: The following instructions use one-inch poultry (chicken) wire and were developed for large scale projects where ease of cutting and cost are important considerations. Habitat Harmony suggests using small mesh hardware cloth to reduce unintended harm to snakes, lizards, reptiles, and other small animals, as well as for increased durability. If you are concerned with accidentally killing non-target animals use ⅛-inch hardware cloth. Anything larger is dangerous to small-bodied snakes and lizards.[41] *If cost is a concern, then using ¼-inch hardware cloth poses less risk than one-inch poultry wire, but may result in entrapment of small animals. We recommend inspecting exposed wire cloth of any size on a daily basis. Be prepared to cut out any entrapped animals until the wire has been thoroughly covered over with dirt or removed at project completion.*

A Summary of Barriers Developed by Pam Wanek

This metal fence barrier was installed between a park and a prairie dog colony and has proven effective in prohibiting prairie dogs from entering the protected area.

The use of barriers for non-lethal control of prairie dogs has been at the forefront of best management practices for at least two decades. Non-lethal control is a paradigm shift in thinking more towards alternatives that stress coexistence with wildlife rather than extermination. For over 100 years humans readily relied on the use of highly toxic chemicals to indiscriminately resolve wildlife conflicts. But these older approaches come with risks to humans and the environment and their efficacy in many cases is not economically feasible. Today, many people are seeking alternatives to humanely manage wildlife rather than older approaches.

Within this document are ideas for barriers but the list is not exhaustive. When selecting barriers it is important to consider the specific site, costs, and maintenance. Environmental elements such as wind, water table, and soil are also important. Site occupancy history is also relevant because the longer prairie dogs have occupied an area, the more extensive their tunnel systems and the higher the probability for non-target species to be present. In general, barriers to exclude prairie dogs should not be installed until all prairie dogs are removed from the conflict zone. Also it is important to keep in mind that many types of barriers are not 100% effective. However, there are attributes of barriers that can reduce human maintenance such as the type of barrier and installation techniques.

Aesthetics, multi-functionality, and zoning regulations are also important. For example, fencing around a yard to contain livestock or pets could be potentially modified to also exclude prairie dogs. Barriers in urban areas are generally subject to more stringent regulations related to aesthetics. Rural areas may be less strict.

There are two types of barriers: physical and vegetative. Physical barriers are generally comprised of manmade fencing (wood, pvc, vinyl, metal) or masonry walls. It is a

generally accepted practice that physical barriers should stand at least three-feet tall, be opaque, and include a deterrent that discourages prairie dogs from climbing over or digging underneath the barrier. Prairie dogs are not inclined to climb but they are diggers so ensure light does not penetrate underneath the barrier.

Using vegetative approaches to exclude prairie dogs involves a review of plant opaqueness, density, whether the foliage is evergreen or deciduous, plants that are odiferous, and water requirements. The best vegetative barriers are opaque, dense, diverse plantings adapted to local conditions.

Vegetative barriers may use shrubs, mid to tall height grasses, various forbs (flowering plants) or a combination to keep prairie dogs out of conflict areas. In all cases, vegetative barriers should include a heterogeneous mix of plants to protect against single species plant diseases and for seasonal effectiveness.

Shrubs can include: wild rose, dwarf and tall rabbitbrush, big western sage, four-wing saltbush, three-leaf sumac, spireas, and juniper varieties. Shrub planting width is dependent on the species selected but generally 10 to 20 foot wide dense swaths are adequate.

Grassy barriers* should include an assortment of cool and warm season species where growth patterns vary over spring, summer and fall seasons. Good grass swaths to maintain are 200 to 300 foot wide. Additionally, it can be aesthetically pleasing to incorporate vegetation with physical barriers.

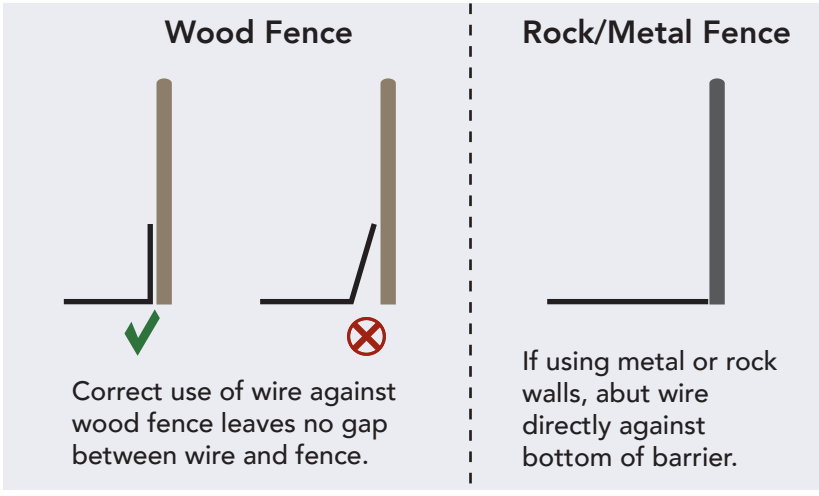
** Note: Grassy barriers and forb barriers may not work well when trying to prohibit Gunnison's prairie dogs from accessing an area. Dense shrubs, hedges, and thick ground covers are likely better vegetative barriers for this species.*

Physical Barriers

1. Skirting

Skirting is used to fortify physical barriers. Skirting is proven to be beneficial by inhibiting prairie dogs from tunneling underneath or chewing directly through barriers. The application involves abutting four to five-foot wide one-inch poultry (chicken) wire against the barrier horizontally with a one-foot lip that extends vertically against the barrier. The one foot vertical lip should be attached to the barrier, typically using a wood staple gun. Skirting should be adequately tacked down to the soil; usually six-inch sod pins suffice. It is important to install pins in a zig-zag pattern, roughly six to eight inches apart along the edge of the poultry wire. Stagger another row of pins at roughly one-foot increments along the midline of the skirt parallel to the fence. In some applications, laying six to eight-inch rock cobble or riprap on top of the skirting will help with aesthetics and inhibit prairie dog tunneling under the skirting.

Application of skirting for one-inch netting poultry wire:



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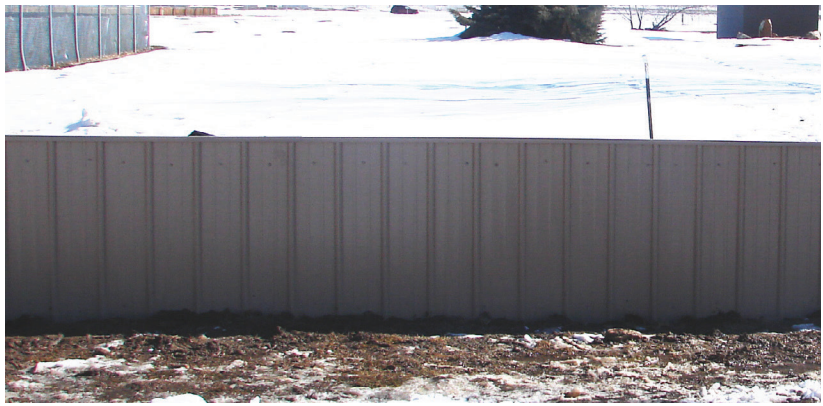
2. Metal Barriers

Metal Barriers are made from metal sheeting (Pro-panel) and are typically trenched two to four feet underground.

- **Pros:** The slick surface is difficult for prairie dogs to climb. A strong material significantly decreases maintenance costs over long periods of time. It creates an opaque visual deterrent both from the horizon and beneath barrier (no light penetration). It can withstand high winds, hail, flooding, and heavy snow loads. The metal is factory painted and offered in a variety of colors that resist color fade and chipping.
- **Cons:** Requires some experience for installation and there may be few or no experienced contractors in your area. Materials may be difficult to find. Repair is expensive (for example, if damaged with landscape or snow removal equipment). Can prevent water drainage. Requires trenching. Soil erosion next to barrier can create gaps allowing prairie dogs to circumvent the barrier by unearthing soft dirt caused by trenching. Gaps can be filled in with sand and skirting installed if needed.



Non-prairie dog side of metal barrier. P. Wanek

Prairie dog side of barrier. Note wildlife safe caps on metal posts and elongated cap along top of metal fencing.

Self-closing swing gate for pedestrians (springs on each side of gate). Metal culvert pipe at threshold blocks light.

Gates for vehicle access. Culvert pipe at threshold blocks light.

3. Fencing

Many types of fencing with modifications such as skirting can work well as prairie dog barriers.

PVC Fence

Rock Wall

4. Wood Fence

Wood Fence – Commonly used for many yards. With modifications wood fencing will work quite well for prairie dog exclusion. In one application (A-C) a wood fence was installed to exclude prairie dogs from a large townhouse project that was built directly adjacent to a prairie dog colony. When the property added turf grass, prairie dogs were readily interested in taking up residency. After removing the prairie dogs using non-lethal passive relocation techniques, this privacy fence was installed with skirting.

Pros: Contractors and materials are easy to find. Wood fence is more likely to be accepted by city or county code and be more aesthetically pleasing. Does not require trenching; wood fence should not be buried. If there are breaches by prairie dogs, single slats can be removed to passively move prairie dogs to correct side of barrier. By incorporating cobble at the bottom of the barrier, it will increase water drainage runoff and fortifies a light-free bottom seam.

Cons: Wood can rot over time. Prairie dogs can chew through the bottom of a rotten fence. However, this can be avoided by attaching skirting. Too much light can show through bottom of fence, especially where fence does not align with contour of land. This requires backfilling with soil or adding rock or landscape edging to inhibit light penetration.

A. Townhomes next to colony.

B. Skirting attached to prairie dog side of fence.

C. Long view.

Wood fences with gates: to inhibit light when the gate is closed, add six-inch metal culvert pipe at the threshold and a vertical lip wood piece on gate.

Overlay board at edge of gate so when closed there is no light penetration.

Add 6-inch diameter steel culvert pipe to seal bottom of gate. Note chicken wire abutting culvert pipe on prairie dog side of barrier to discourage digging under the pipe.

Large wood gates for heavy equipment access: The choice of large gates for heavy vehicle access can make a big difference for prairie dog exclusion. Swing gates are easier to modify than those that slide into a pocket mechanism.

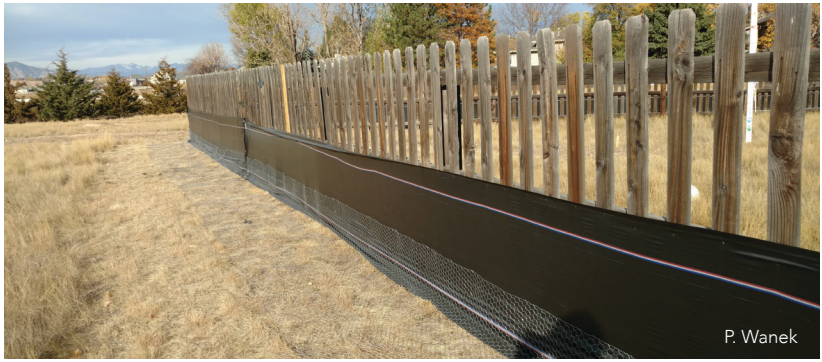
The swing gate above was modified in three ways:

1. Buried six-inch diameter culvert pipe;
2. Welded strip of metal at the bottom of metal gate frame (used as a light and physical barrier);
3. Skirting installed against threshold.

Wide spaced vertical wood slat – with modifications: Prairie dogs circumvented wide slat openings into an incompatible area. After prairie dogs were passively removed, the fence was modified by tacking black silt fence directly to the wood fence and then adding chicken wire skirting against silt fence. (See examples A-C on next page.)

NOTE: the pictured example (A-C) is not a permanent solution but was used given limited funds and unknown future land use.

***A.** Existing fence before modifications.*



***B.** Modified to exclude prairie dogs by adding black silt fence and skirting.*

***C.** Exclusion area no longer prairie dog occupied.*

5. Vinyl Barriers

Vinyl barriers, starting in the mid 1990's, were truly the first pioneering technique for prairie dog exclusion and with modifications are still effective barriers. The material is a tough woven opaque vinyl that withstands weather for long periods of time if properly installed. It is sold by Reef Industries in Texas. There are two heights, 36-inch or 42-inch (for trenching) with grommets positioned at three-foot intervals along the top and bottom of the barrier. Each barrier is sold in 300 foot lengths.

Example #1: Long-Term Construction Project

Used vinyl instead of silt fence due to better durability. The vinyl was trenched into the ground and held up by T-posts and smooth wire running through the top grommets. This project involved using non-lethal passive relocation methods to move prairie dogs out of the way of a large concrete path and trail installation. Once completed, the barrier was removed.

Temporary vinyl barrier used during construction project.

Example #2: Chain-link Application

On the prairie dog side of fence, use five-foot wide one-inch netting poultry wire, attach one-foot of wire vertically to the chain-link and anchor remaining four feet to the ground using six-inch sod pins. Using 36-inch wide vinyl barrier, attach top grommets to fence with clips or use smooth wire to weave grommets into fence links. Anchor bottom grommets by inserting two 11-inch edging pins per grommet into the ground.

Prairie dogs non-lethally removed from developed park. (non-prairie dog side)

Modified existing chain-link fence to inhibit movement back into park. (prairie dog side)

Example #3: Vinyl Barrier Attached to T-posts

T-post and single strand wire (inserted through grommets to hold up the vinyl barrier) can sag without proper supports. Wooden "H" brackets are recommended every 100 feet to help with retightening (use as pull posts with wire tightener).

The illustration below has at least two flaws:

1. A slack line may cause too much wind pressure causing metal grommets to rip.

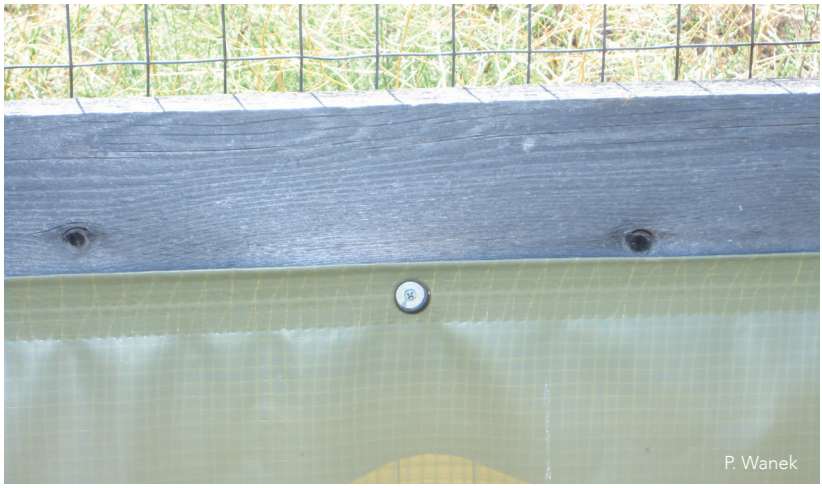
2. There is no protection along the bottom of the barrier to inhibit prairie dogs from chewing directly through the barrier or digging underneath.

Flawed vinyl barrier installation.

Example #4: Post and Rail with Vinyl

This multifunction fence is used in many situations (parks, open space trails, fences along residential homes, and for containment of domestic pets) and can be modified to exclude prairie dogs. Using wood rails as both structure and to attach grommets (with a screw and washer) creates a good long-term barrier for prairie dogs. However, there are a few problems with this particular application.

Non-prairie dog side



Screw and washer through grommet

What's wrong with this barrier?

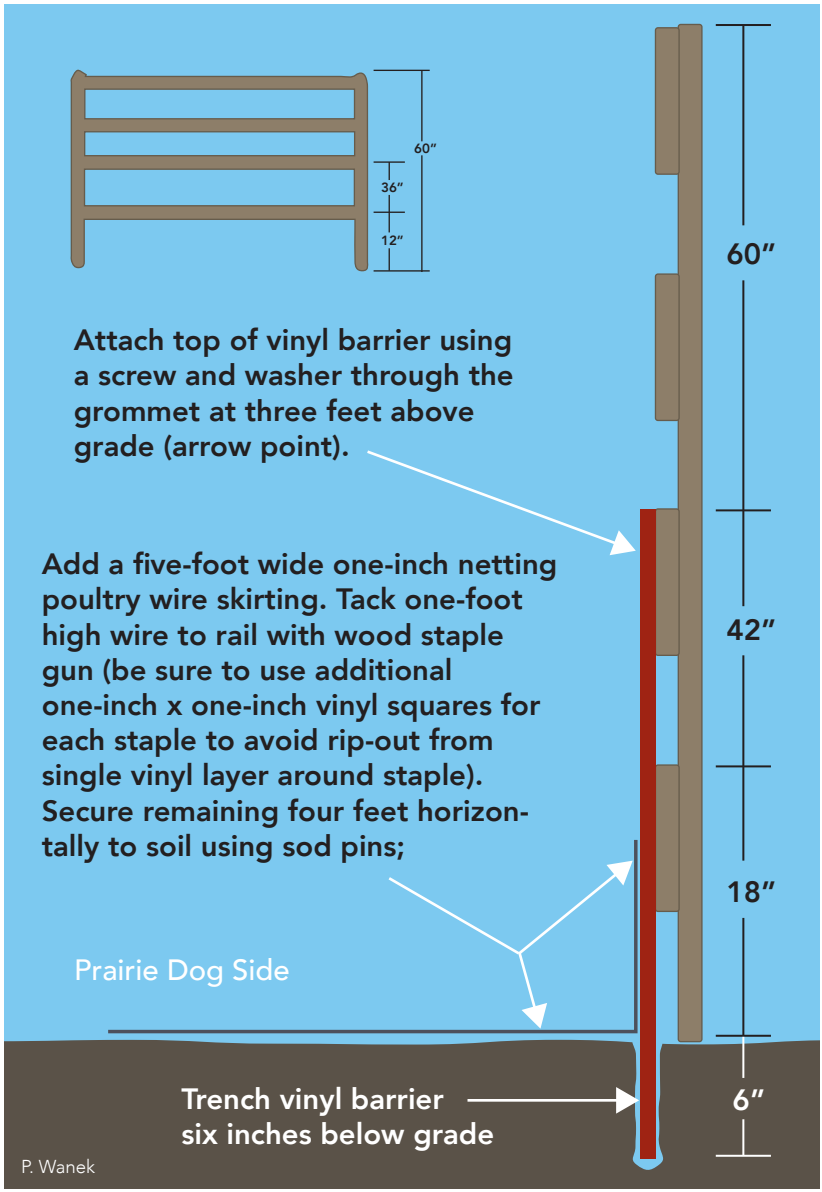
1. The vinyl barrier is not tall enough as a visual deterrent (see black arrow indicating gap). Barrier height minimums should be at least three feet.

2. Vertical skirting on prairie dog side of barrier is too tall so prairie dogs can grip and climb over the barrier. And there is no horizontal skirt on the ground to discourage digging under the barrier.

Prairie dog side

Example #5: Modified Livestock Fence

5-foot high wood rail fence. Two options to secure vinyl: 1. Trench vinyl barrier six inches below grade (use 42-inch width vinyl so 36-inch will stand above grade); or 2. Use 36-inch width vinyl and attach vinyl bottom into the ground using two 11-inch landscape edging pins per grommet.



Example #6: Vinyl Barrier Backed with 4-foot Tall 2-inch by 1-inch Welded Wire

42-inch wide vinyl barrier was trenched six inches into ground and attached to two-inch by one-inch by 4-foot tall welded wire for structural support (attached to five-foot T-posts every 10 to 15 feet). And then added four to five-foot wide one-inch netting poultry skirting on prairie dog side. Poultry wire was held up vertically by thin gauge wire that was inserted through the vinyl and attached to the T-post.

Prairie dog side

Non-prairie dog side

6. Silt Fence

Silt fence is commonly used to control erosion on construction sites and is useful for short-term exclusion of prairie dogs. The fabric is three feet wide and pre-attached with staples to 3.5 foot tall stakes at 10 foot intervals. The stakes protrude about six inches along the bottom of the fence for pounding into the soil. Silt fence is sold in 100-foot lengths. We recommend buying DOT grade silt fence as the stakes are stronger than cheaper grades.

There are pros and cons to silt fence and opportunities for modifications. The advantages are the fence is easy to find in most hardware stores and installation is not too difficult. Some disadvantages are that the winds can rip the fabric out of the staples and over long periods of time prairie dogs may try to chew through the barrier. Modifications shown in photos will help with longevity.

Silt fence with stakes and staples exposed.

Prairie dogs have chewed through the fence.

Modification: Twist fabric around stake for longevity.

Modification: Using two-foot wide one-inch netting poultry wire, lip one foot vertically and use a staple gun to attach to wood posts. Anchor horizontal piece to ground with six-inch pins.

Silt fence used in large field.

Silt fence used for pending construction.

7. Wood Slat Snow Fence

This fencing is commonly used for wind and snow breaks along highways and in conjunction with vegetation rows to aid in their establishment. As the name implies, it catches

snow and captures moisture while breaking harsh winds; making the fence useful for inter-planting vegetation and vegetative windbreak rows. Fence specs are four-foot high by 50-feet long with wood slats that are spaced about 1.5 inches apart that are woven together by very strong wire.

Pros: Easy installation with five-foot T-post (attach to post by intertwined wire on wire, not wood slat). Relatively easy to find. Because of the slats, there is a breezeway. Slats create a partial visual barrier and protects plants. Useful as a semi-opaque visual deterrent and could be used in conjunction with establishing vegetation barriers. This barrier should not be trenched.

Cons: Slat spacing may not be adequate for full visual deterrence. Prairie dogs could chew through bottom slats or between slats.

The application below needed a temporary fence that could withstand winds. To compensate for prairie dogs breaching through the fence, poultry wire skirting was added with an unsecured one-foot "flop" at the top edge to discourage prairie dogs from climbing over.

Prairie dog side

Non-prairie dog side

8. Straw Bale Barrier Application

Straw bales may be effective in limited situations. Pictured below are large bales that are 7-foot long by 4-foot tall. The advantage is the bales provide an immediate visual obstruction. Disadvantages are the bales can quickly fall apart, prairie dogs can climb or dig through bales, and they can create a mouse haven. Avoid near residential areas.

Straw bales along prairie dog side of fencing.

9. Other Barriers and Ideas

Example #1 - Recycled mining conveyer belts *– used against a horse arena provides a good visual and physical deterrent. Arena kick boards could also be effective.*

Example #2 - Electric weave fence *– lacks visual deterrent but will deter prairie dogs should they come against the fence. It is easy to install and is charged by solar power.*

10. Landscaping with Hardscape Materials to Exclude Prairie Dogs

Materials such as concrete, pavement, pavers, and rock are effective to impede prairie dogs from digging. Use in medians, next to pedestrian paths, next to building foundations, or to protect developed parks.

Athletic field

Parking lot median

Pedestrian path

11. Vegetative Barriers

Juniper shrubs create an uncomfortable low dense mat for prairie dogs and can be used as low maintenance plantings next to buildings and inside medians with other plantings.

Windbreak rows and bushy living barriers provide a good option to inhibit prairie dog movement especially for large landscapes.

Shrub row: includes tall green rabbitbrush, three-leaf sumac and mountain mahogany (Cercocarpus ledifolius).

Windbreak row with Rocky Mountain Juniper and three-leaf sumac.

In areas where prairie dog expansion is desired, controlled burns, increased livestock grazing, and mowing are effective.

Manipulation of vegetation can direct prairie dog expansion and contraction. During high precipitation years, where grasses and plants obtain good growth, prairie dog colonies contract. Drought conditions create the opposite situation causing prairie dog colonies to expand. This is an important concept to understand. For example, if prairie dogs are not desired in an area, avoid clearing shrubs and mowing, at least through late spring and/or early summer (when highest prairie dog dispersal is likely to occur depending on prairie dog species).

City and county vegetation/weed ordinances should consider leniency on private lots next to occupied prairie dog sites. Overly stringent vegetation regulations could encourage prairie dog occupancy into conflict areas.

On landscapes where prairie dogs are allowed to exist in more natural areas, some managers deliberately reduce vegetative heights to encourage expansion of prairie dog populations when needed. And, depending upon the type of vegetation involved, mowing in new areas where occupancy is desired and avoidance of mowing where prairie dogs are less desired can shift populations on the landscape over time.

Vegetative Plantings

A variety of plants can be effective deterrents. Use vegetation in large groupings or to soften a physical barrier. As with any vegetation component, incorporate varieties for interest and protection against single species disease. A small list of ideas are presented below:

Moist → Dry

Native Mixed Introduced

Shrubs

Juniper (*Varieties*) M
Three-Leaf Sumac/Skunkbush (*Rhus trilobata*) N
Gro-low sumac (*Rhus aromatica*) M
Big Western Sage (*Artemisia tridentata*) N
Four-wing Saltbush (*Atriplex canescens*) N
Curl-leaf Mountain Mahogany (*Cercocarpus ledifolius*) N
Spirea (*Varieties*) M
New Mexico Privet (*Forestiera pubescens*) N
Golden Currant (*Ribes aureum*) N
Alpine Currant (*Ribes alpinum*) I
Wax Currant (*Ribes cereum*) N
Potentilla (*Potentilla, spp.*) M
Wild rose (*Rosa woodsii*) M
Coyote Willow (*Salix exigua*) N
Golden/Tall Rubber Rabbitbrush (*Chrysothamnus nauseosus*) N
Dwarf Rubber Rabbitbrush (*Chrysothamnus nauseosus nauseosus*) N

Note: Check with your county extension office or local native plant suppliers to find native shrubs appropriate for your area.

APPENDIX

D Methods That Have Been Proven Ineffective

Following are some "solutions" in circulation that may seem logical and appealing, but have been shown not to work well enough to warrant our recommendation.

Raptor Perches

Installing raptor (also known as birds of prey) perches to encourage predators to scare away prairie dogs from an area has not been shown to be an effective deterrent. In addition, perches can be detrimental to wildlife that you may not want to impact, such as burrowing owls, songbirds, etc. There has been no controlled study to specifically test the efficacy of raptor perches to help control prairie dogs. A study on raptors and mice did show that the placement of artificial raptor perches reduced (a) the rate at which a mouse population increased and (b) the maximum mouse population density.[42] Another study determined that although perch availability may be of some importance in attracting raptors (golden eagles, ferruginous hawks, and red-tailed hawks) to prairie dog colonies, the number of prairie dogs available in the colony is a more likely predictor of its attraction to predators.[43]

The use of artificial perches to attract raptors may be a useful addition to management strategies in certain situations. In these scenarios, the method is not used as a deterrent but as a tool to possibly keep the colony population density down and thus slow expansion. However, colony density is only one of the factors affecting expansion. Expansion is also affected by resource availability and suitable adjacent habitat.

Commercially Sold Repellents and Homemade Mixes

To date, no repellent has been deemed effective for controlling prairie dogs. Some of the products specifically found to be ineffective are fox urine, coyote urine, red pepper, castor oil, blood meal, thiram, and Uncle Ian's Gopher Repellent. Experts agree that repellants are not a viable means of protecting an area from prairie dogs. In one case, fox urine had no effect on the prairie dogs, but was said to have spooked the horse the homeowner was trying to protect from injury.

Movement Detectors/Alarm Systems and Other Scare Tactics

Scare tactics have proven ineffective at inhibiting colony expansion or in moving prairie dogs out of an area. One method that proved to be impractical and ineffective was to provide predator cover for coyotes and other predators. When straw bales were placed in the colony to provide predator cover, they were used by prairie dogs as surveillance platforms.

One homeowner set up an elaborate system of movement detectors that when activated by prairie dogs set off an alarm, but the alarm did not limit prairie dog activity on the property. Boulder Parks and Recreation (Colorado) tried sonic repellents (combination of sound and vibrations) but prairie dogs grew accustomed to the devices. There was no apparent behavioral change, and their use was discontinued.

APPENDIX E

RDT Field Notes Sample

You can download this as an excel spreadsheet:

https:habitatharmony.com/rdt.xlsx

Prairie Dog Reverse Dispersal Translocation Field Notes

Burrow #	Start Date/Time	Check Date/Time	Notes on Activity (Close 72 hours (3 days) of no activity after sticks moved.)
	Close Date/Time		
Burrow #	Start Date/Time	Check Date/Time	Notes on Activity (Close after 72 hours (3 days) of no activity.)
	Close Date/Time		
Burrow #	Start Date/Time	Check Date/Time	Notes on Activity (Close after 72 hours (3 days) of no activity.)
	Close Date/Time		
Burrow #	Start Date/Time	Check Date/Time	Notes on Activity (Close after 72 hours (3 days) of no activity.)
	Close Date/Time		

APPENDIX F

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Habitat Harmony, Inc. is a tax-exempt, nonprofit corporation founded upon the recognition of the inherent value of the natural world. Our mission is to work toward a sustainable, healthy future for the native wildlife and natural habitats of northern Arizona. Our focus has been the prairie ecosystems of northern Arizona with emphasis on protecting prairie dogs, an important keystone species.

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