Prairie Dog Management and Conservation Benefits

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ABSTRACT: Prairie dog management has evolved over the decades and present control efforts are often directed at management zones in support of prairie dog or black-footed ferret conservation. The availability of prairie dog management tools has also evolved. We present the efficacy and practicality of specific methods and provide examples of the conservation benefits of prairie dog management. Potential conflicts between conservation efforts and regulatory efforts of multiple agencies are also discussed.

Key Words: conservation, *Cynomys spp.*, damage, management, plague**,** prairie dog

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INTRODUCTION

Prairie dogs (*Cynomys* spp.) are a burrowing rodent native to western North America. Black-tailed prairie dogs (*C. ludovicianus*) were thought to occupy between 80-104 million acres but have been reduced to some 2.4 million acres in recent years (USFWS 2009a). Two species, the Utah prairie dog (*C. parvidens*) and the Mexican prairie dog (*C. mexicanus*) are protected under the US Endangered Species Act (ESA) and the Gunnison's prairie dog (*C. gunnisoni*) is currently considered a candidate species for ESA listing (USFWS 2008).

While prairie dogs have long been intrinsically valued in their own right, historically they have also been viewed as competition for livestock (Merriam 1901). Much of the initial research conducted on prairie dogs was designed to quantify the degree to which they compete with livestock or to develop methods for control. Similarly, while conservationists have long appreciated the role of the prairie dog as a key stone species, conservation of prairie dogs has often been driven by the need to protect other dependent species (Sharps and Uresk 1990), including the black-footed ferret (*Mustela nigripes*). The black-footed ferret is totally dependent on prairie dogs for food and habitat and has been listed as an endangered species since 1967 (USFWS 2013). Between 2004 and 2010, the US Fish and Wildlife Service responded to petitions to list black-tailed, white-tailed (*C. leucurus*) and Gunnison's prairie dogs under the ESA (USFWS 2010). Despite negative findings for black-tailed and white-tailed prairie dogs, conservation concern remains high for prairie dogs.

THE ROLES OF PRAIRIE DOG MANAGEMENT

Prairie dog management initially was synonymous with control. Individuals, and later government programs, killed prairie dogs with toxic baits and fumigants. Forrest and Luchsinger (2006) summarized records of black-tailed prairie dog control. While such accounts accurately reflect cumulative acreage of prairie dog poisonings, the data can be misleading in that many prairie dog colonies were repeatedly poisoned following recovery. For example, Forrest and Luchsinger (2006) report that 1.2M ha of area encompassing prairie dog colonies were poisoned in South Dakota between 1915 and 1965. However, USFWS data from that time indicates that major campaigns were conducted on the Rosebud Reservation in each decade, beginning in 1915 and extending into the 1960's (Bureau of Indian Affairs 1994). The cumulative acres treated during this time far exceed the total acreage for the reservation and it is clear that many acres were treated 5-6 times during the reported interval.

While the consensus of many is that early efforts at eradication were ill-conceived and ecologically unsustainable, it should be noted that prairie dog removal is still necessary to support conservation. The very role of wildlife damage management is to enhance tolerance for wild populations which cause conflict with humans. As an example, for the 13 year period from 1994 through 2006, all of the prairie dog control requests received by the Utah USDA-APHIS-Wildlife Services (WS) program were for control of prairie dogs in cultivated agricultural fields or in association with school yards or cemetery's. No rangeland prairie dog removals were conducted.

Similarly, purposeful management of prairie dogs involves dealing with the causes of their decline. In some cases, prairie dog populations will need to be reestablished. In most cases, sylvatic plague abatement will be necessary to maintain long-term persistence of individual colonies. Prairie dog management, then, involves the almost dichotomous actions of protecting prairie dogs where tolerance is great and removing them where conflicts exist. In practice, this may actually be on two sides of the same fence.

PRAIRIE DOG ENHANCEMENT

Several techniques exist for the establishment and enhancement of individual colonies. While prairie dog survival and recruitment are certainly affected by environmental conditions we are aware of no data to evaluate the potential role of supplemental feeding or forage manipulation to enhance prairie dog populations. Likewise, while several authors report a relationship between livestock grazing intensity and habitat suitability (with a positive correlation to high grazing intensity), we are reluctant to suggest "prescribed overgrazing" as a method to enhance prairie dog habitat. Similarly, the potential role of prescribed fire in managing prairie dog habitat is untested. However, as purposeful prairie dog management progresses as a science, research into these topics would be useful to assist managers in evaluating a full complement of options.

Translocation

The reestablishment of prairie dogs through translocation has occurred for well over four decades and the success of translocations has increased through adaptive management. Utah prairie dog colonies have been trapped as mitigation for development or agricultural damage and as an effort to recover that species. Specific recommendations for translocating Utah prairie dogs exist (USFWS 2009b). Long et al. (2006) summarized translocation recommendations for black-tailed prairie dogs. In addition, a significant number of black-tailed prairie dog colonies have been translocated from areas of development on the front range of Colorado. Important considerations, they point out, include methods used to capture the prairie dogs, the importance of moving entire family groups (coteries) for survival purposes, disease risks associated with moving prairie dogs as well as careful site selection and preparation.

Plague Management

Sylvatic plague, caused by the bacterium *Yersinia pestis*, causes mortality within prairie dog colonies approaching 100%. It is generally accepted that the bacterium is non-native to the US and arrived on the West coast around 1900. The plague bacterium has become established in many species of rodents and spread from California across the western US to about the 102nd meridian, though cases have been identified east of that line in Texas. All states with prairie dogs also have plague present.

While plague epizootics have an immediate, devastating effect on prairie dog populations, the role of enzootic plague is not well understood. There may be low levels of plague circulating in a population which reduces survivorship of individuals, but is rarely detectable.

Plague management for enhancement of prairie dogs is currently available only through the annual application of insecticides, which kill the fleas which transmit the bacterium from one prairie dog to another. Most commonly applied is Deltadust (Bayer Environmental Science, Montvale NJ). Deltadust contains deltamethrin and is applied directly to soil within the burrow entrance. Prairie dogs self-apply the chemical when they enter or leave the burrow and the stability of the product allows it to effectively kill fleas for a longer period of time than other chemicals. The cost of dusting varies with travel, mechanical stability of the application equipment and with the density of prairie dog burrows within a colony. In South Dakota, the cost for dusting black-tailed prairie dog burrows in the Conata Badlands has ranged from $20.09 to $22.19 per acre since 2009 (R. Griebel, USGS, pers. comm.). In Texas, costs per acre were $23.69 in FY 11 (including an emergency action) and $22.80 in FY 12- both figures include the purchase of mechanical dusters and parts which are reused each year.

The development of a sylvatic plague vaccine for oral delivery to prairie dogs has advanced within the past two years (T. Rocke, USGS, pers. comm.). During 2013-2015, field tests will be conducted to determine field efficacy as well as nontarget risks. If successful, the product may be registered for sylvatic plague management, potentially providing managers with a new tool for plague management in the future.

Economic Incentives

Economic incentives, such as payments to private landowners for prairie dog acreage, or the removal of disincentives, such as providing regulatory relief and boundary control, provide opportunities for purposeful prairie dog management on private lands. For a number of reasons, the best potential habitat for prairie dogs remains in private ownership. Working with landowners to keep prairie dogs on the landscape is necessary to achieve the conservation benefits prairie dogs provide.

Financial incentives may include a direct payment for land within prairie dog complexes, as well as land on which they might expand. While the debate regarding to what degree prairie dogs compete with livestock continues, it is undeniable that the prairie dog's contribution to biodiversity is through the consumption and removal of vegetation and the resultant maintenance in seral stage of the rangeland. If this condition is left unmanaged, the landowner objectives for the land may not be met. Direct payments, by government agency or non-governmental organization, should reflect local grazing rates and costs of offset feed or reduced gain for livestock.

Financial incentives alone will not be sufficient to prevent concern regarding prairie dog expansion. Boundary control, that is the removal of prairie dogs which expand from managed areas to lands where they are not welcome, is a necessary component of purposeful management. Whether removals are conducted on the land of the recipient of payments or on their neighbor, boundary control will demonstrate a willingness to address the conflicts of prairie dog management without compromising the core area where benefits are necessary.

Regulatory relief includes any of a number of packages which provide management flexibility for prairie dogs. Currently, since black-tailed, white-tailed and Gunnison's prairie dogs are not listed under the ESA, regulatory relief has focused on mechanisms to enhance acceptance of black-footed ferrets. Right or wrong, many rural residents object to endangered species listings because of perceived loss of control over land uses. Regulatory relief, including safe harbor agreements, ESA permit conditions, and ESA Section 10(j) designations are all designed to maximize management flexibility while maintaining necessary protections for ferrets. Should other species of prairie dogs become listed under the ESA, similar programs, along with Section 4(d) permitting, will be necessary to maintain public acceptance of prairie dogs.

Recreational shooting, ironically, provides a form of incentive to private landowners. Whether shooting prairie dogs as a family activity for a landowner or charging trespass fees for visiting shooters, shooting increases tolerance for prairie dogs. While untested, shooting certainly decreases the abundance of prairie dogs which may decrease disease risk for density dependent diseases. Reeve and Vosberg (2006) summarize shooting effects on black-tailed prairie dogs. Because black-tailed prairie dogs exist in more dense colonies that either white-tailed or Gunnison's prairie dogs, caution should be used before extrapolating their analysis to these other species.

PRAIRIE DOG REMOVAL

Recognizing that prairie dog removal is designed to increase tolerance for prairie dogs, it may be important to evaluate when and where prairie dog removal should be conducted. The authors recognize that not everyone will agree on these concepts and welcome sincere debate on the merits of these suggestions.

Prairie dogs, while intrinsically valuable as individuals and charismatic as a species, probably do not belong where their burrowing damage public infrastructure. Airport runways, roads cemeteries and sports complexes provide limited ecological benefits and mandated persistence on these sites only exacerbates negative opinions of the species.

Concern about plague impacts from prairie dogs also causes us to evaluate whether prairie dogs should be tolerated where human activity is high. Following a plague-induced mortality event, plague infected fleas migrate from their dead hosts to the burrow entrance, where they seek a new host in the form of a companion animal of human walking nearby. While plague was especially active in New Mexico during the 1970's and early 1980's, many human exposures were linked to prairie dog mortality events in towns or on school grounds (New Mexico Department of Agriculture, 1979 unpublished data). With this background and for liability reasons, county health departments often request prairie dog control at schools. While this concern may also be addressed through burrow dusting, the liability risk must be weighed against the ecological benefits.

Prairie dogs in cultivated croplands cause economic damage through loss of crop and potential equipment damage. Crops most commonly damaged include alfalfa, mixed hay and wheat. Tall annual crops, such a sudan grass or corn, is rarely invaded. Irrigated crops are especially attractive and Utah prairie dogs are most numerous on private, irrigated crop land. Prairie dog burrows also damage cropland infrastructure, including irrigation ditches. Removal of prairie dogs from these areas alleviates economic losses, but as these prairie dogs are often associated with rangeland colonies, immigration frequently occurs and control must be repeated at frequent intervals.

Perhaps most controversial is prairie dog control on private rangeland. Some conservation groups would prefer to use regulatory mechanisms to force landowners to support prairie dog colonies, while some farm groups would assert the landowners right to manage their property as they see fit. Certainly, some of the requests for removal of prairie dogs do not meet an economic threshold for costs of damage (compared to the cost of control). In these cases, landowners may be assigning an economic value to the risk of damage averted, or to the loss of control they would have if the prairie dogs were protected under stringent measures. In this way, conservationists may be creating a disincentive to the very goals they profess to achieve.

Public rangeland prairie dog control occurs only today where prairie dogs from public land threaten nearby private land. In a few states, public land control may be possible to create a buffer zone to prevent immediate occupation of private land from adjacent public land. This is limited to a very few locations annually. Protection of public rangeland resources from prairie dog colonies is currently unnecessary and indeed plague has replaced prairie dog management on public lands to the point that population viability is threatened in some areas.

Integrated Wildlife Damage Management (IWDM)

IWDM follows an Integrated Pest Management model in integrating mechanical, chemical, cultural and biological methods. In addition, IWDM recognizes the ecological value of native wildlife and strives to balance the ecological costs with the economic costs (Bodenchuk 2007).

Shooting of prairie dogs as a control strategy is potentially successful for boundary management, removal of a few individuals from a highly valuable area (i.e. livestock arena) or for reducing the potential for growth. Shooting by any one individual may not be aggressive enough to produce acceptable results and changes in prairie dog behavior may negate the benefits of shooting. While the discussion above about the economic value of recreational shooting, it should be noted that as a damage management tool, shooting may be limited to small colonies. It should also be noted that shooters often overestimate their take so reported removal from unreliable sources should be viewed skeptically.

Trapping of prairie dogs is another mechanical method which has been implemented, but has limited benefit. Live-trapping may be an important source of prairie dogs for translocation, but costs per prairie dog removed are very high compared to other methods. Like shooting, this may be feasible for very small colonies or in areas where other methods may not be practical due to public access. While body-gripping traps have been used in the past, they remain unselective when set in a prairie dog burrow and should be avoided.

Another mechanical method involves the use of a patented vacuum system that removes prairie dogs from their burrows by high volume suction. A compartment, lined with foam, is used to contain the captured prairie dogs. Because this is an expensive method, its use is limited to communities where practical solutions are not accepted. As with live-trapping, captured prairie dogs may be an important source for translocation.

Toxic baits include 2% zinc phosphide (ZnPh) on grain or in pellet form and chlorophacinone (trade name Rozol- Liphatech). Both products are restricted use pesticides and require applicators to be licensed. Several companies and USDA/APHIS Wildlife Services manufacture 2% ZnPh grain bait. ZnPh has the advantage of extremely low secondary risks and low non-target risks (USDA 1994), confined primarily to graniverous birds which do not frequent prairie dog towns during the primary use period. ZnPh baits degrade in the presence of moisture, so little persistence in the environment is expected. However, ZnPh baiting requires prebaiting with nontoxic grain to enhance efficacy, which increases costs. With effective prebaiting in place, efficacy near 80% should be expected. Grain baits are most effective in late fall when prairie dogs are consuming dry seeds.

Rozol contains chlorophacinone, an anticoagulant which causes death 4-5 days after consumption of a lethal dose. Lee et al (2005) reported mean efficacy of 91.4% without prebaiting, from Rozol placed within the burrow. The current EPA approved label lists several important use restrictions. First, when using this product you must follow the measures contained in the Endangered Species Protection Bulletin for the county you are to apply the product. Second, bait must be placed at least 6" inside the burrow entrance. Third, starting within 4 days of treatment, and repeating every 1-2 days for at least 2 weeks, applicators must return to the site and conduct carcass searches using a line-transect method which covers the entire treated area. Carcasses found must be collected and buried. Rozol is labeled only for use in black-tailed prairie dogs.

Fumigants are another chemical method commonly used for prairie dog removal. Registered fumigants include a "gas cartridge", aluminum phosphide (AlPh) and magnesium phosphide (MgPh). All fumigants are toxic to any animal found within the burrow, so their use should be carefully monitored to avoid impacts to non-target wildlife such as burrowing owls or black-footed ferrets.

The gas cartridge is manufactured by WS and is currently considered a general use chemical. Gas cartridges are used by inserting a fuse in one end and lighting the fuse. Once the cartridge begins burning, it is placed in the burrow which is sealed with soil. The burning cartridge produces carbon monoxide, which is heavier than air and kills through cellular suffocation. Application of gas cartridges is labor intensive and is usually restricted to areas where only a few burrows need to be removed or as a follow-up to grain baits. Gas cartridges are less effective in dry, cracked soils and pose a fire risk under some conditions. Efficacy is 75% or better when soil conditions are good.

AlPh and MgPh both form phosphine gas in the presence of moisture. Commonly, even the low relativity humidity of air within the prairie dog burrow is adequate to form phosphine gas. Either product is placed in the burrow, which is then sealed with a soil plug. As a best practice, a plug of crumpled newspaper should be used to avoid covering the AlPh or MgPh tablets. Prairie dogs generally die immediately below the newspaper plug, and scavenging animals (badgers and coyotes) often open burrows to consume the prairie dog, which pose no secondary risk to the scavenger. Either product produces 80-95% efficacy, also depending on the soil type. While more labor intensive, and thus expensive, than grain baits, these two fumigant products may be used at any time of the year if prairie dogs are active. Another advantage, and one of the reasons the products were developed, is that they kill the fleas that inhabit the burrow system. AlPh or MgPh then should be considered if control is conducted on a school ground, for example, for the prevention of plague.

Cultural methods include fencing, visual barriers and raptor perches. Fencing as a management tool may be appropriate to exclude prairie dogs from high value areas, but it is extremely expensive and requires maintenance. Fence materials need to be buried to prevent prairie dogs from burrowing under. Fencing is currently being implemented at one airport in the range of the Utah prairie dog, but its long-term efficacy has yet to be determined.

Andelt (2006) considered visual barriers ineffective at preventing prairie dog occupation. While some research has identified success with the method, other research has not. As a matter of practice, creating visual barriers is expensive, but maintenance is much more costly. Wind and livestock both take their toll on visual barriers and eventually they all break down.

While increasing predation through the construction of raptor perches is appealing, there are equivocal results. It may be noted that raptor perches already exist in the form of powerlines which transverse many prairie dog colonies, and prairie dogs adapt well to these. On the other side of the issue, many Utah prairie dog translocation colonies were unsuccessful. Of the sites studied, raptor predation on the small transplanted colony was responsible for the loss of the colony. It is unlikely that increased predation through the construction of raptor perches is effective to provide meaningful management.

Other ineffective methods include chemosterilants and gas exploders. Given the reproductive potential of prairie dogs reproductive inhibitors, of which none are currently registered, would at best slow the growth of a colony. The nontarget risk as well as the secondary impacts of reproductive inhibitors has yet to be evaluated. Gas exploders are commercially available, but their efficacy on prairie dogs is currently questionable. While the exploders might be effective on burrowing rodents with smaller burrows, the large volume associated with a prairie dog burrow makes this a questionable practice. In addition, gas exploders pose some fire risk and are objectionable to many people.

The only biological method of control is plague. While the authors do not suggest the introduction of plague into a colony, the reality is that plague is already on the landscape and will eventually find its way into a prairie dog colony. The decision not to manage plague is still a decision, and plague management has replaced human management in most prairie dog colonies today.

CONCLUSION

Purposeful management of prairie dogs requires establishing objectives and creating an environment for humans and prairie dogs to coexist. In some cases, purposeful management will involve enhancing populations through a variety of programs and actions. In others, it will involve reducing human/prairie dog conflicts effectively to promote tolerance and develop trust. In both cases, prairie dog conservation will be well served.

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