

Conservation Strategy for the Utah Prairie Dog

by

Utah Prairie Dog Recovery Plan Implementation Committee

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Summary

Current monitoring of the recovery of the Utah prairie dog suggests that new strategies for recovery need to be implemented. The Utah prairie dog Recovery Plan Implementation Committee proposes a three phase conservation strategy: habitat improvement, research, and public information and education. These new efforts should help improve the short-term persistence of the Utah prairie dog, develop a more complete knowledge base that can be used to revise recovery goals, and improve education and attitudes of local citizens about prairie dog recovery. These efforts should help bridge the gap from current dissatisfaction with the pace of prairie dog recovery to revised, achievable recovery goals and their future implementation. Specifically, the committee calls for rangeland revegetation (burning and reseeding) at six new sites associated with existing prairie dog complexes, followed by translocation of prairie dogs from private land to mitigate impacts of land development. Research should be conducted on the population dynamics of existing complexes, the effects of range revegetation and grazing on the success of prairie dog translocations, and the consequences of extinction of local populations for prairie dog genetic diversity. Finally, an integrated program of information and education should be implemented by special teaching in public schools, using local prairie dog colonies as demonstration sites, and informing, through extension, agricultural producers of ways in which livestock and prairie dogs might mutually benefit.

Introduction

In 1973, the Utah prairie dog, *Cynomys parvidens*, was declared an endangered species due to drastic reductions in its numbers due to plague, drought, pest control programs, and human-related habitat alteration resulting from cultivation and poor grazing practices. By 1984, its status was reclassified to threatened due to rapid increases in numbers on private land. Recovery of the prairie dog since 1973 has involved two efforts: (1) development of an official recovery plan, based on recovery goals established in 1987 and completed in 1991, and (2) translocation of "surplus" prairie dogs from private land to suitable sites on public land to achieve these goals.

The overall goal of recovery efforts was to establish populations of greater than 813 adult animals on public land in each of three different recovery areas (West Desert, Paunsaugunt Area, and Awapa Plateau), as called for by a population viability analysis (Seal 1987). To achieve these goals, prairie dogs from private land were translocated to several sites on public land within these three recovery areas, with translocations occurring for several consecutive years at each site. Populations approached recovery goal levels in all three areas in the late 1980's, but declines in the early 1990's suggested that existing translocation sites probably could not sustain these levels. McDonald and Bonebrake (1994) evaluated the success of translocations for the West Desert recovery area and found that, while prairie dog populations persisted at some sites, persisting numbers were only a small fraction of the number of prairie dogs translocated to these sites. These results suggest that previous translocation efforts are unlikely to produce recovery goal population levels of prairie dogs.

Recent monitoring of several translocation sites suggests that translocations have been largely unsuccessful. Most approved translocation sites in the Iron County did not meet suitable habitat criteria outlined in the recovery plan, and received no monitoring following translocation of prairie dogs (McDonald and Bonebrake 1994). Specifically, few sites had less than 15% cover of shrubs other than rabbitbrush (*Chrysothamnus viscidiflorus*), and both cool-season and warm-season grasses. Moreover, sites reseeded to a monoculture of crested wheatgrass (*Agropyron desertorum*) performed poorly as translocation sites. McDonald and Bonebrake (1994) speculate

that suitable translocation sites are rare, given that translocation sites have rigorous ownership requirements (e.g., > 1 mile from private or Utah state trust lands), and most public land has more shrub cover than that specified in the recovery plan.

In addition to monitoring existing , other research suggests that stated recovery goals for prairie dogs may be based on incorrect assumptions about prairie dog population dynamics. In an analysis of prairie dog population trends since 1976, local prairie dog complexes showed large fluctuations over time, such that any complex was likely to go extinct within a 30 year period (M.E. Ritchie in preparation). Furthermore, changes in prairie dog numbers do not appear to be due to random fluctuations in environmental conditions (e.g., precipitation, snow depth, etc.), but rather to interactions among individuals within complexes, their food supply, and/or their predators and diseases. Ritchie speculates that Utah prairie dogs represent a true metapopulation composed of smaller local populations that periodically drive themselves to extinction. The existing recovery plan alludes to the idea that prairie dogs may exist as a metapopulation, but the population viability analysis upon which the recovery goals are based does not incorporate metapopulation dynamics into the calculation of viable population size. Thus, the recovery goals may be unattainable due to the inherent characteristics of prairie dog population dynamics.

Slow prairie dog recovery and the accompanying perception of a potentially flawed ecological basis for recovery goals has spurred dissatisfaction among citizens in southern Utah. These citizens feel that the recovery goals, as stated, are not achievable. They propose to include private land populations as part of the "recovered" population and force the Fish and Wildlife Service to de-list the prairie dog, or to make stronger efforts to translocate prairie dogs from private to public lands. This is particularly true in Cedar City and Panguitch, where large prairie dog populations on private and urban lands have slowed development. However, some livestock permittees on public lands have expressed unwillingness to have prairie dogs translocated to their allotments. These conflicts have produced greater impetus to recover the population, but introduce important constraints on how recovery might be achieved.

The overall lack of success of previous recovery efforts, apparent lack of suitable prairie dog habitat, new information on patterns of extinction of local prairie dog populations, and strong public interest in resolving the problem have created strong pressure to alter the manner in which the recovery plan is implemented. Consequently, the Utah prairie dog Recovery Plan Implementation Committee (RPIC) was formed in late 1994 to address these issues and make new plans for prairie dog recovery. This committee is interdisciplinary, and involves representatives of federal agencies (U.S. Fish and Wildlife Service, Bureau of Land Management, U.S. Forest Service, and National Park Service (Bryce Canyon)), state agencies (Utah Division of Wildlife Resources), academic scholars (Utah State University, Brigham Young University), and local citizens. Currently, the committee recognizes that existing criteria for prairie dog recovery are unlikely to work, but that the information necessary to define new and better criteria is not yet available. Thus, this document proposes a *conservation strategy* for management policy over the next five years (1995-2000) that promotes

- (1) *habitat improvement* for existing and new prairie dog populations,
- (2) *research* to determine more precise habitat suitability criteria and new recovery goals, and
- (3) *information and education* to facilitate a better environment for resolving conflicts among local citizens and between citizens and land/wildlife management agencies.

Below, we propose specific procedures for addressing these three initiatives and improving efforts to recover Utah prairie dogs. We plan to carefully integrate these initiatives so that each complements the other. By the year 2000, we should have sufficient information to revise recovery goals and list achievable criteria for the recovery. In the meantime, these initiatives should provide new momentum in prairie dog recovery and mitigation of human-prairie dog conflicts.

Conservation Strategy

To address these initiatives while furthering recovery efforts, we propose to establish three areas for new prairie dog translocation in association with existing public land prairie dog complexes (collections of colonies within 2 miles of each other that exchange individuals annually). We intend to mitigate existing human-prairie dog conflicts in private and/or urban areas by translocating prairie dogs from conflict areas to new sites. These sites will serve as research areas to determine the effects of major habitat manipulation or improvement practices (fire, seeding, grazing) on the persistence of prairie dog complexes. In addition, we will use these associations of complexes to study mechanisms of population decline (e.g., overexploitation of plant food, predation, plague) that will better predict both the impact of habitat on prairie dog population dynamics and the patterns of extinction of local complexes for the species' entire population. Finally we propose to use these new translocation sites and other sites as demonstration sites in a program of information and education about the positive effects of prairie dogs on rangeland ecosystem. In particular these sites can be used to show how habitat improvements for prairie dogs also benefit livestock production and other wildlife (e.g., mule deer, pronghorn, sage grouse, various raptor species).

Habitat Improvement

Translocation of prairie dogs to new sites has been the primary method of recovery since the prairie dog was listed as endangered in 1976. Translocation sites were selected based on qualitative vegetation criteria (Crocker-Bedford and Spillett 1981, Jacquardt et al. 1986, Coffeen and Pederson 1993) and political land ownership constraints (McDonald and Bonebrake 1994). Most existing public land complexes (which count toward recovery) occupy sites that do not meet the habitat criteria specified by the recovery plan (U.S. Fish and Wildlife Service 1991). Most of these sites contain 20-35% cover of tall shrubs such as sagebrush (*Artemisia tridentata*), rubber rabbitbrush (*Chrysothamnus nauseosus*), or saltbush (*Atriplex canescens*), which compete with grass forage species and obscure visibility of predators. In addition, areas clear of sagebrush often result from active habitat manipulation (chaining or burning shrubs) that are seeded with a virtual monoculture of crested wheatgrass for livestock forage. Although a cool-season grass, crested wheatgrass matures early and tends to outcompete other plants (REF) that are important forage later in the growing season, e.g., warm season grasses, perennial forbs (Crocker-Bedford 1976). Thus, habitats associated with existing prairie dog complexes seem less than ideal for prairie dog persistence.

The lack of habitat suitable for prairie dogs is chronic (McDonald 1993, 1994); most areas within the species' range that were grasslands in pre-settlement times have been converted to shrublands through long-term livestock grazing and fire suppression. In addition, most of the best original prairie dog habitat is now intensively farmed or has been converted to urban uses. Thus, the historical habitat of the Utah prairie dog has virtually disappeared except in small patches, many of which have already been used as translocation sites. These sites may be marginal habitat, i.e.,

exhibit large variation in plant production, and therefore more likely to produce large fluctuations in prairie dog numbers that contribute to repeated extinctions. As for many other threatened and endangered species, therefore, suitable habitat may be the single most important factor constraining the recovery of prairie dog populations. Given that most potentially suitable habitat lies in areas currently farmed, grazed or developed for urban use, any effort to increase prairie dog habitat is likely to invoke conflicts with citizen stakeholders. Thus, any solution for prairie recovery must develop new habitat but also resolve these conflicts.

Although not widely used in the management of threatened and endangered species, we believe active habitat management is the only way to recover the Utah prairie dog. Specifically, we suggest that chaining or burning areas to remove shrub cover and re-seeding these areas with a diversity of plant species and growth forms in addition to crested wheatgrass will restore productive grasslands and provide new habitat for prairie dogs. We feel that such manipulation mimics the natural, pre-settlement habitat of prairie dogs, in which grasslands were maintained by periodic fires. In addition, such manipulation is consistent with sound range management practices (Savory 1987, Coughenour 1991) and may benefit livestock production by dramatically increasing forage production. Thus, management of a threatened species may actually *increase* the use of land by livestock producers, and such an outcome contrasts with that achieved by recovery plans for other threatened species, e.g., the desert tortoise. Habitat manipulation should also benefit other wildlife species that are currently in decline in southern Utah, including sage grouse (*Centrocercus urophasianus*), pronghorn (*Antilocapra americana*), and mule deer (*Odocoileus hemionus*). Overall, "active" habitat management for prairie dog recovery serves as an example of ecosystem management, in which the interests of a threatened species, human stakeholders, and other wildlife species are integrated in an ecosystem context.

We are unsure of the best method of habitat manipulation because this will depend on the effects of livestock grazing, shrub removal method, effectiveness of re-seeding, etc, and a specific overall plan awaits the outcome of future research exploring these effects (see below). However, we can manipulate some habitats in the next two to five years in association with existing prairie dog complexes and imminent prairie dog translocations. In cooperation with the appropriate management agencies and livestock permittees, we plan to implement six prescribed burns at new 80+ acre sites, with pairs of sites located within three miles of each of three existing complexes and greater than two miles from each other (Fig. 1). We will employ mechanical removals if burns are not practical. These sites are currently dominated by perennial shrubs but show the potential to produce native grassland once shrubs are removed. We expect these sites to demonstrate positive effects of habitat manipulation on prairie dog success as well as on forage production for livestock and population densities of other grassland species, e.g., sage grouse, pronghorn, etc.

Prairie dogs will be translocated to each of these six habitat manipulation sites, following established methods (Crocker-Bedford and Spillett 1981, Jacquardt et al. 1986, Coffeen and Pederson 1993), to establish new colonies in association with existing complexes. We will introduce 200 prairie dogs at each site for three consecutive years, so that each translocation site will receive 600 prairie dogs over . Prairie dogs will be translocated to two new sites each year, for a total of 3600 prairie dogs translocated over the period 1996-2000 (Table 1), to spread the risks of translocation success over different sequences of annual weather conditions. At the three sites we have chosen, we expect that some exchange of prairie dogs between existing complexes and the new translocation site will occur, so that natural recolonization of the new site can occur if the translocated population goes extinct (or vice versa).

We expect that translocation in combination with habitat manipulation is likely to improve the chances of prairie dog persistence above the rate previously observed for translocations

(McDonald and Bonebrake 1994). Research conducted within each translocation site and its associated complex of existing prairie dogs should provide useful post-translocation monitoring information (see below). In addition, each of the manipulation zones and translocation sites should demonstrate the effectiveness of habitat manipulation in promoting prairie dog persistence and coexistence with livestock and other wildlife.

Research

Several previous studies provide basic natural history information about Utah prairie dogs that has been useful in prescribing translocation sites (Collier and Spillett 1975, Crocker-Bedford 1976, Crocker-Bedford and Spillett 1981, Hasenyager 1983, Jacquardt et al. 1986). However, these criteria are not associated with long-term success in increasing prairie dog populations or finding appropriate translocation sites (McDonald and Bonebrake 1994). A major problem in translating prairie dog biology into management has been the lack of monitoring of vegetation changes, grazing practices, disease and prairie dog demography at established and translocated populations. In particular, scientists and managers still do not understand why complexes show such great fluctuation in numbers, and whether existing populations have a chance to reach recovery goals. Thus, future research is critical to develop a conservation strategy for the prairie dog.

The reasons for continuing low numbers of prairie dogs in recovery areas are unclear. Suitable habitats for prairie dogs are naturally fragmented into local populations (complexes) that comprise the larger aggregate population (metapopulation). Such complexes may undergo frequent stochastic demographic extinction. Alternatively, they may overexploit their food resources or suffer mortality through plague and drive themselves to extinction. In addition, spatially isolated complexes may be more likely to go extinct or less likely to recover following extinction. Repeated extinctions of complexes may prevent prairie dog metapopulations from achieving consistently high numbers.

Existing prairie dog complexes are associated with deep, loamy soils, production of cool season grasses well into summer, and a lack of shrubs, tall grasses and/or other visual obstructions (Jacquardt et al. 1986). Prairie dogs strongly select cool season grasses in their diet (Crocker-Bedford 1976), but juveniles may rely on summer production of warm season grasses for sufficient food to survive over winter. However, it is still unclear how forage characteristics of habitat affects prairie dog dynamics. Other factors, such as predation or disease, that may or may not be related to habitat, may have stronger effects. Less information exists on the effects of land use practices, e.g., grazing, rangeland management, on prairie dog success. Studies of other prairie dog species (Coppock et al. 1983, Cid et al. 1991) suggest that large grazers, such as bison and cattle, are indirect mutualists with prairie dogs. This may be particularly true when grazing occurs in seasons other than spring, such that it enhances primary production and reduces shrub invasion (Coppock et al. 1983, Holland et al. 1992). However, the extent to which grazing in any season affects Utah prairie dogs remains unknown.

More recent research suggests that knowledge of the mechanisms of Utah prairie dog population dynamics, e.g., food limitation, predation, disease, etc. may be crucially important for recovering their population. Analysis of population trends since 1976 for > 40 complexes (Ritchie in prep.) suggest that any complex can be expected to go extinct once every 25 years. Moreover, these extinctions appeared to be related to interactions among prairie dogs within a complex, rather than random events. Thus important within-species interactions, e.g., overexploitation of food, disease transmission, or stress-induced vulnerability to disease may best explain repeated crashes

and/or extinctions of complexes.

These previous results suggest that further research is sorely needed to develop a long-term conservation strategy for the prairie dog. Thus, our conservation strategy will support current studies of existing data and new field studies to address three research questions. First, what appears to be the most likely explanation for the high rate extinctions of local populations, and how does this alter specific numerical goals for recovery of the species? Second, can rangeland revegetation and altered grazing practices improve the persistence of translocated populations? Third, what are the genetic consequences of high rates of local extinction for prairie dogs, and how does this affect the spatial arrangement of translocation sites and numerical goals for population recovery. These three areas of research will be addressed by currently ongoing studies of existing data, planned studies of effects of habitat manipulation on prairie dog success, and potential new studies of genetic differentiation among local populations.

Current research (Ritchie in prep.) is analyzing existing data from annual prairie dog counts at existing complexes (on both public and private land), precipitation and temperature data from weather stations near these complexes, and information about the spatial location of complexes. For complexes with complete records (i.e. counted every year since 1976), I will attempt to explain the annual changes in prairie dog populations from prior year's density and weather conditions by using modern time series analysis techniques (Box and Jenkins 1976, Turchin 1990, Turchin and Taylor 1992). For all complexes, I will calculate average persistence time, probability of extinction per year, and maximum population size. These variables will then be related to whether colonies occur on private vs. public land, the distance to the nearest colony, and the density of colonies within an arbitrarily defined large area (e.g., 100 km²) that potentially contains a number of prairie dog complexes. I will also relate the persistence and extinction probabilities of each complex to the large-scale habitat type by plotting complex locations on a GIS habitat overlay. If funds allow, habitat types associated with successful complexes can be matched with a GIS public land overlay to help identify potential sites for prairie dog translocation efforts. This analysis should show whether extinction of prairie dog complexes is (1) due to stochastic demographic events, weather, or deterministic density dependent interactions, (2) more likely on less suitable (e.g., shrubby, dry, high elevation) habitats, (3) more likely on geographically isolated colonies, and (4) more likely on public than on private land.

Proposed research that has not yet begun will address whether habitat improvements and/or grazing schemes will improve success in translocating prairie dogs, I propose the following experiment. Six replicate sites with existing sagebrush/desert shrub dominated plant communities on deep enough soils to support prairie dog burrow systems will be chosen and a factorial design of grazing and revegetation (shrub removal and grass reseeding) treatments on each of four 10 ha plots (separated by at least 100 m) will be established at each site (Fig. 2). These treatments will be (1) spring livestock grazing with no revegetation, (2) spring grazing with revegetation, (3) no grazing (or fall grazing) with no revegetation, and (4) no grazing with revegetation. This plot size should be sufficient to allow > 20 translocated adult prairie dogs to colonize. Treatments will be established at two sites each year beginning in spring 1996 to spread the effects of treatments over different sequences of annual weather conditions. After the establishment of treatments, 200 prairie dogs will be translocated onto each plot, according to standard techniques (Jacquardt et al. 1986) each year for three years (see **Habitat Improvement**). I will measure four main responses of prairie dogs to these treatments: foraging rates and activity budgets for use in bioenergetics calculations, overwinter survival rates, litter sizes, and juvenile growth rates. Prairie dog responses will be measured for 2-3 years following translocation to evaluate success. These measurements should facilitate projection of population trends for transplanted prairie dogs on different vegetation treatments. Overall, the experiment should show whether fall grazing and/or

revegetation significantly improve the success of prairie dog translocation.

Repeated extinctions of local populations are thought to greatly reduce genetic diversity within total populations (Hastings and Harrison 1994). A unique potential exists to evaluate the genetic consequences of local extinctions for the genetic diversity of Utah prairie dog because of the annual adult censuses since 1976 and corresponding population time series. Such information will be important in determining recovery goals for a genetically viable population. Existing techniques in molecular analysis of small amounts of genetic material allow genetic differences among individuals within and between local populations to be determined with high resolution. Blood or tissue samples of live prairie dogs trapped from various complexes could be analyzed using these techniques. Although no studies are currently planned, we strongly encourage them.

Information and Education

Any recovery program for a threatened and endangered species in a democratic society depends on tacit agreement by the public that recovery should occur. For the Utah prairie dog, past and present conflicts between land management agencies and local citizens make this a special concern. Consequently, a conservation strategy for the prairie dog must include specific goals for disseminating information to the public. We propose a three-pronged approach:

- (1) Establish (or promote) prairie dog colonies near urban areas as demonstration sites.
- (2) Establish contacts in primary and secondary schools to allow special classes and/or field trips to learn about prairie dogs.
- (3) Work with university and county extension agents to provide agricultural producers with information about the recovery process, recovery goals, and ways in which agriculture and prairie dogs can coexist.

Each of these efforts should present clearly the idea that the prairie dog is important to the sustainability of the local rangeland ecosystem and that public lands are managed for multiple use. In addition, prairie dogs and management practices associated with their recovery are probably likely to benefit grazing livestock. If these goals are achieved, public attitudes should at least change from the idea that "humans are the endangered species."

A principal hurdle that must be overcome in many human - wildlife conflicts is public access to the species in question. Prairie dogs have an advantage in this regard because they live in open spaces and are diurnal. Consequently, one good way to increase public awareness and knowledge of prairie dogs is to establish demonstration or "watchable wildlife" populations near roadways in urban areas (e.g., Cedar City, Panguitch). For many people, this may offer their first encounter with the prairie dog in a natural environment. Moreover, such demonstration populations offers the opportunity for people to perceive the prairie dog as something other than an economic threat or rifle target. Such sites would also offer easy, direct access for primary and secondary school students as part of a special public school program (see below).

One of the best ways to change long-term public attitudes is through public education. Because of the prairie dog's high visibility, a program of special presentations, accompanied by field trips, in local public schools might have significant impact. Such a program might be carried out by local agency or extension personnel, and involve videotapes, slide shows, demonstrations of captive prairie dogs, or visits to colonies. Involvement of parents might have a particularly

strong impact. Demonstration sites close to urban areas would greatly facilitate these activities.

An influential group which has particularly poor perceptions of prairie dogs and their role in rangeland ecosystems are agricultural producers. To some extent, the existing private lands control program has reduced conflicts over potential large-scale agricultural damage on cultivated private lands. However, on grazing land, particularly on public grazing allotments, prairie dogs are still perceived as competitors, despite research results to the contrary for other prairie dog species (Coppock et al. 1983). A major extension effort, coupled with new demonstration sites (e.g., Adams Well and proposed habitat improvement sites) and research results, should provide information to livestock permittees on public land that rangeland that favors prairie dog success also favors livestock production. Thus, habitat improvements targeted at recovering prairie dogs should also benefit livestock producers. These habitat improvements, if performed at no expense to the producer and over sufficiently large areas, might allow for controlled increases in AUM's allotted to producers. An extension program might involve brochures, field trips for county agents, meetings at field demonstration sites ("windmill chats"), special presentations and demonstrations to secondary school vocational groups such as FFA, and other activities.

Within the range of the Utah prairie dog, the cultural history of local attitudes towards federal government interference and wildlife on agricultural and range lands will make changes in public attitudes difficult. However, a strong program of information and education that promotes the idea that humans and prairie dogs can coexist might help relieve local public perceptions of "us vs. the government." At the very least, increased public awareness might reduce the frequency of conflicts that arise from ignorance of management agency policies and intentions and public perceptions of being "shut out" of decision processes.

Table 1. Numbers of prairie dogs to be translocated each year in conjunction with new habitat improvement sites and habitat research.

Year	No. Sites	No. Prairie Dogs
1996	2	400
1997	4	800
1998	6	1200
1999	4	800
2000	2	400
Total		3600

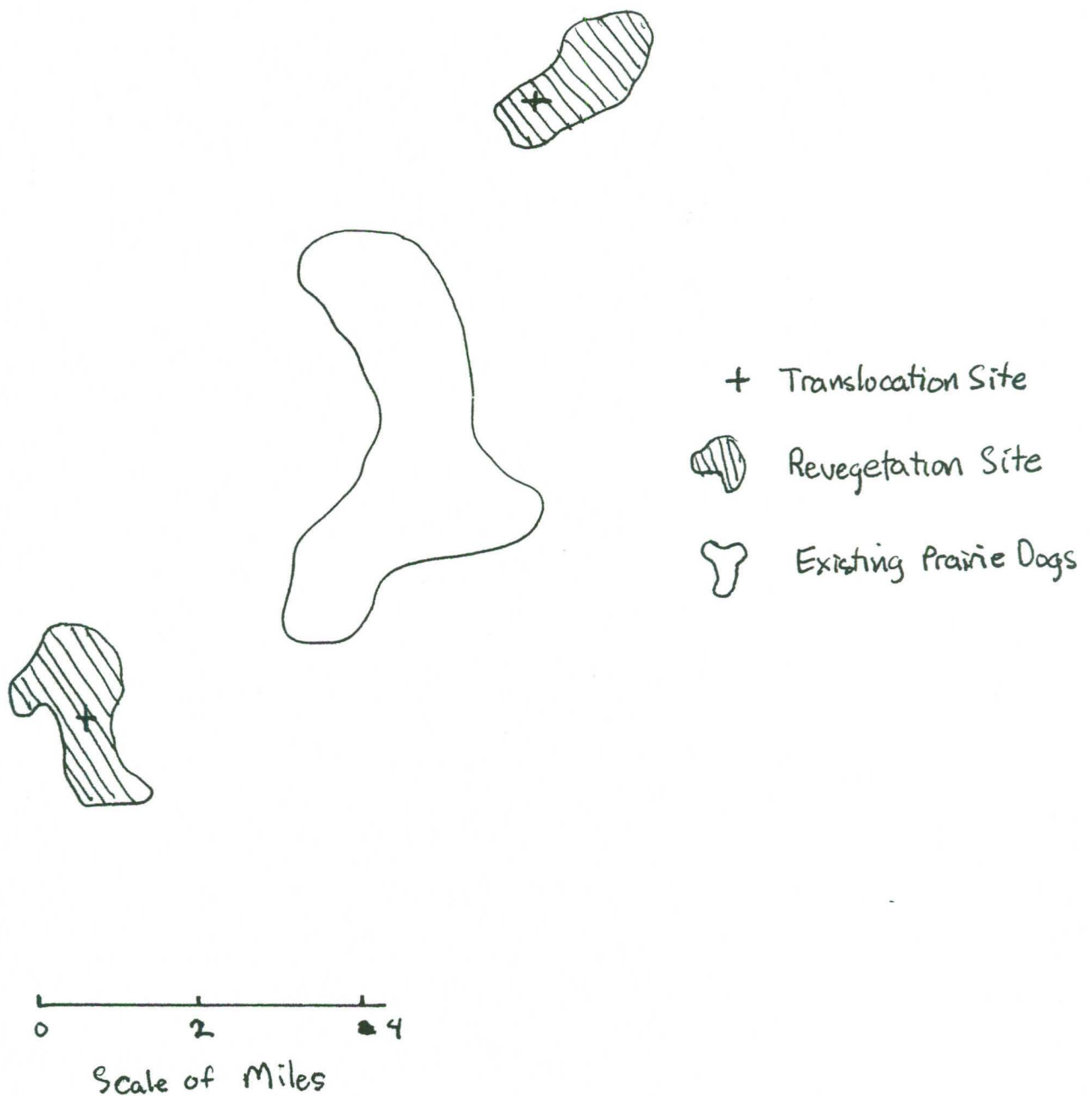


Figure 1. Association of habitat improvement (revegetation) sites and prairie dog translocation sites with an existing prairie dog complex

Experimental Design for Habitat Research

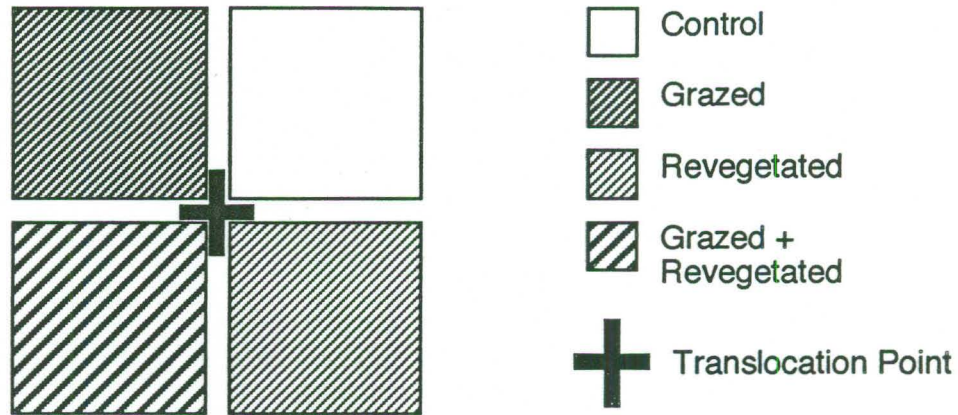


Figure 2. Schematic of experimental design at each new translocation site. Each plot is 1/4 mile on each side or 40 acres in area. The translocation release point is given by a plus sign.