Prairie Dogs
Study Proposal/Field Protocol

Reintroduction and Monitoring of Prairie Dog Populations: A Study Proposal

Since the Pleistocene Epoch the black-tailed prairie dog (*Cynomys ludovicianus*) has inhabited the region between southern Canada and northern Mexico. Black-tailed prairie dogs are primarily found in the Upper Sonoran life-zone, but some colonies are found in both the Lower Sonoran and the Transition life-zones (Smith 1958). This species prefers short-grass and mixed-grass prairie, but also occupies shinnery oak-grassland, tall-grass prairie, and mesquite-grassland habitats (Cheatheam 1977, Lewis and Hassien 1973, Osborn 1942).

Since 1900, black-tailed prairie dog populations have declined by 98%. Eradication programs, habitat loss due to agricultural and urban uses, and disease are the primary causes (Cinnamon 1996, Gober and Lockhart 1996, and Miller, *et al*. 1994). As a result, the associated biota dependent on symbiotic relationships with prairie dogs has been negatively impacted (Miller, et al. 1994, Sharps and Uresk 1990).

The black-tailed prairie dog was once a part of the Guadalupe Mountains National Park's (GMNP) ecosystem, and the reintroduction of this species has both aesthetic and functional values, such as enriching the soil and providing food and shelter for other animals. GMNP staff have been working to reestablish a colony since 1997 to enhance biodiversity. Student participation could be a component of this project, whereby students gain an understanding of scientific method and process, as well as a stewardship ethic.

The prairie dog is considered a keystone species (Miller, *et al.* 1994). A keystone species (also called critical or target species) is one whose disappearance will be followed by a decrease in the area species diversity (Soule' and Simberloff, 1986). Extinction of a keystone species can cause the extinction of other dependent species due to complex mutualistic relationships, and entire food webs may collapse (Wilcox and Murphy 1985, Myers 1986). Due to reduced prairie dog populations, the black-footed ferret (*Mustela nigripes*), which depends on the prairie dog for food, is near extinction (Gober and Lockhart 1996, Lewis and Hassien 1973).

Prairie dog colonies provide a unique ecological sanctuary for other animals. Where prairie dogs occur there are greater arthropod and small mammal populations, an increase in bird diversity and density, and greater predator populations (Agnew, *et al*. 1987, Agnew, *et al*. 1986; Miller, *et al.* 1994, Tyler 1970). Burrowing owls (*Speotyto cunicularia*), and reptiles use prairie dog burrows for shelter and hibernation. Prairie dogs are food for many mammalian and avian predators such as the badger (*Taxidea taxus*) and red-tailed hawk (*Buteo jamaicensis*) (Gober and Lockhart 1996). About 170 vertebrate species are dependent on the prairie dog for survival (Miller, et al. 1994).

Prairie dogs enhance habitat diversity by regulating plant species diversity and by enriching the soil (Miller, et al. 1994, Sharps and Uresk 1990). Burrowing, which aerates and mixes organic material (plant and animal waste) into the soil, alters soil structure and chemistry. The nutrient content of the soil is increased and this enhances plant diversity and productivity. Constant grazing near burrows stimulates forb and grass regrowth, and grazed plants have a higher nutritional value than mature plants. Prairie dog grazing and plant regrowth attract livestock, bison and pronghorn antelope to prairie dog colonies.

Due to ecosystem degradation, since prairie dogs were extirpated from the park, more human intervention appears to be needed to establish and maintain a self-perpetuating colony. Students, teachers and other interested individuals might provide GMNP with needed manpower to make this project a success.

Black-tailed prairie dogs, once common in the Guadalupe Mountains National Park, were eradicated by poison (GMNP 1996). They were last seen in the park in the mid-1960s. Prairie dogs have been known to inhabit five areas in the park. Locations that once provided suitable habitat, which are compatible with existing land use as identified in the 1996 environmental assessment, should be given consideration for this reintroduction project.

A subspecies of *Cynomys ludovicianus*, *C.l. arizonenses* selected for relocation is from a similar habitat and is a subspecies historically found in the region (Cottam and Caroline 1965, Hall and Kelson 1959). Prairie dog colonies in the Sierra Blanca area, Hudspeth County, Texas, will be used as a source for this project. Another potential source area is Otero Mesa in Otero County, New Mexico (West 1998).

Restrictive criteria established to select reintroduction sites, which limit and control the distribution and location of prairie dogs in GMNP, is also a part of this proposal. “Prairie dogs would not be reintroduced within one mile of a campground or trail facility and would be at least one mile from a park boundary. If prairie dogs move onto private land or into areas that conflict with the above guidelines, attempts would be made to trap and relocate them to an appropriate site.” (GMNP 1996).

A suitable site on the west side of the park will be selected by the National Park Service for this reintroduction project. By targeting areas once used by prairie dogs one can conclude that the soil is suitable for burrowing. According to Lewis, *et al*. (1979) suitable release sites should be well-drained uplands (hillcrests and slopes) with sandy loam or clay soils (fine sandy soils are not suitable burrow material) with predominantly short grass species.

Soils in the park are predominantly calcareous, and common plant species in potential relocation sites are black grama (*Bouteloua eriopoda*), mesa dropseed (*Sporobolus flexuosus*), sand dropseed (*Sporobolus cryptandrus*), honey mesquite (*Prosopis glandulosa*), soaptree yucca (*Yucca elata*) and creosote bush (*Larrea tridentata*) (GMNP 1996).

Soil type and vegetation in the prairie dog source area should be used as criteria for the selection of the relocation site. Soil and plant information from field observation and NRCS data can be used to match source area with potential relocation sites.

Prior to releasing prairie dogs at the selected site, plant and animal inventory data will be collected to establish baseline information. Permanently located transects will be used to provide initial plant inventory data and subsequently annually monitored. Photographic monitoring (still and video) will also be used to compare and document conditions at the site. The site will also be mapped and inventoried using the Global Positioning System (GPS). If a population of prairie dogs is established, visual counts and/or mark-recapture trapping will be used to evaluate the success of the project. Also behavioral studies (social, feeding, disbanding, etc.) and predation studies can be initiated to monitor adaptation to the site.

Optimum times for observation are up to 2.5 hours after sunrise and 2 hours before sunset. Population counts should be done when maximum numbers of prairie dogs are above ground, which is 1.5 to 2.5 hours before sunset in late May when the juveniles have emerged (Powell, et al. 1994).

Techniques used in the Oklahoma Panhandle by Lewis *et al.* (1979) to establish and limit (fencing, use of repellent, killing) prairie dog colonies may be of use in this project area. His goal was to establish colonies of 10 prairie dogs per ha (average density for Panhandle dog towns). A synopsis of his method and other comments follow:

1. Prairie dogs will not dig burrows and establish new colonies in the fall. The optimum months for capture and relocation are June and July when the pups are large enough to leave the burrow, and they are still with their mothers. Optimum release time at GMNP would be in August after rains have stimulated plant growth.

2. Twenty to 30 prairie dogs are sufficient to establish a new colony. Robinette, *et al.* (1995) found that survival of relocated prairie dogs was directly related to the number of animals released. Groups of 60 prairie dogs per site were found to be optimal for establishing new colonies. If 20 to 30 prairie dogs could be captured and relocated it would increase the chances of establishing a self-perpetuating colony.

3. Sex and age composition of 20 released prairie dogs should be two to three males to establish a coterie, and the remainder mostly adult females (for 30, it would be four males). The releasing a ratio of at least 1 : 6 males to females at the site is recommended.

4. Prairie dogs were kept in their holding cages for three to five days to adjust to the new site and to reduce the possibility of emigration. A temporary poultry fence around a 0.25 ha area was also used to discourage emigration. (Lewis *et al*. 1979). It is recommended that these procedures be used at the release site.

Also the relocated animals might be induced to stay if a "home flavor" is added to the relocation site by bringing about a kilogram of soil from each capture burrow to be placed at each release burrow (although this seems to have had no bearing at the GMNP site).

Determination of minimum viable population is subjective. Soule' (1987) states "there is no single value or 'magic number' that has universal validity." According to Lehmkuhl (1984) an effective population size must be 50 or more individuals in order to keep the inbreeding rate below 1% per generation. When the inbreeding rate approaches 50 to 60%, the population becomes susceptible to extinction from genetic causes. Since prairie dog behavior discourages inbreeding, primarily through dispersal (Garrett and Franklin 1988, Hoogland J. L. 1982), Lehmkuhl's findings are not as significant for areas having nearby prairie dogs towns. For this project, inbreeding could be a problem. It is recommended that additional males from a different source site be released at the relocation site five months later during breeding season in January, in order to reduce the inbreeding rate and increase the genetic variability of the new colony (Daley 1992).

Hypothesis

The selection of prairie dog reintroduction sites in GMNP that have similar vegetation and soil properties to the collection site, will maximize the re-establishment probability.

The following methods will be used to test this hypothesis.

1. Selection of Relocation Site

A suitable relocation site comparable in vegetation and soil type to the site where the prairie dogs are captured should be located in GMNP. Evaluation of NRCS data for Hudspeth County, Texas, Otero County, New Mexico and field inventory of capture and relocation sites will be used for this evaluation process. A chi-square test will be used to compare vegetation and soils at the sites. Hopefully, a suitable relocation site will be found and prepared on the west side of the park.

2. Evaluation of Relocation Site

Permanently located 33m (100ft) point transects will be established to monitor changes in grasses and forbs. Transect line intercepts will be used to collect data on trees and large shrubs. One set of transects will be established at the relocation site and another set of transects will be established nearby where similar soil and plant composition exists. Differences between the two transect areas can be measured in terms of means and standard errors. The chi-square can be used to test for differences between the two sites. A technique similar to Giles' (1969) will be adapted to collect plant transect data. Transect data will be augmented by photography and video. Visual counts can be made on a regular basis to estimate arthropod, bird, reptile, small mammal, predator and big game populations. Sites will be mapped using the Global Positioning System.

3. Preparation of Release Site

The site will need to be cleared to provide short-grass aspect. This can be accomplished through mechanical means or scheduled in advance into the park's prescribed fire program. The cleared area needs to be a minimum of 0.25ha (0.5ac). Mowing not only simulates prairie dog foraging effect, it also reduces the stress level of the relocated animals if they are able to detect potential predators.

The same technique used by the Park Service, in 1997, for spacing and drilling holes can be used at this site. If the site selected has abandoned prairie dog burrows, some may be augered to make suitable starter burrows. Release cages will be placed over the starter burrows and staked to the ground. The release area must be dusted with Drione Insecticide powder containing 1% pyrethrines. Some experimentation with bringing soil from the capture site to give the relocation site a home flavor may continue. A kilogram of soil for each starter burrow should be brought to the site.

Poultry fencing (chicken wire) will be placed around the site. The following is an adaptation of the method used by Lewis et al. (1979) requiring no trenching. Chicken-wire 0.9m (36in) high will be used to enclose the release site. T-posts will be placed 6m (20ft) apart. Two strands of slick or barbed wire will be attached to the T-posts, one strand at the bottom and the other at 0.62m (26in) above the ground. Chicken wire will be fastened to the slick or barbed wire. The top 0.25m (10in) will be loosely attached to every other T-post by a slack-wire, allowing the top of the chicken wire to fold inward when a prairie dog tries to climb over the fence. Chicken wire will also be placed on the ground, with one edge attached to the bottom wire of the fence and the other edge staked to the ground. This *ground fence* will be partially covered with dirt and rocks to discourage tunneling.

4. Capture and Release Site

We will capture 20 to 30 members (mostly females and juveniles) from coteries. Captured animals will be sexed, aged, weighed, and treated for fleas and ticks. Blood samples for DNA studies at Texas Tech University may be taken at this time. People handling prairie dogs must use flea and tick repellent, wear long sleeve shirts, boots and leather gloves to protect them from diseases such as bubonic plague. To facilitate field observation of relocated prairie dogs, Nyanzol D (black) dye could be used to mark the males (Robinette, *et al*. 1995; Giles 1969).

We recommend the following actions to encourage prairie dogs to stay at the release site: (1) Confine prairie dogs to release cages at least 3 days before letting them burrow out. The release area should be fenced. (2) Cages should be modified by placing boxed enclosures inside for sleeping and hiding. (3) Attach sunshades to the top of the cages. (4) Attach water bottles to the cages. (5) Feed native forage and a

three-way sweet mix. (6) Salt augered holes with soil from capture site. When prairie dogs establish burrows, we will remove the cages. Water and supplemental food will be provided until the cages are removed.

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Reintroduction and Monitoring of Prairie Dog Populations: Field Protocol

Site Selection

1. Soil and plant information from field observation and Natural Resource Conservation Service (NRCS) data will be collected for the prairie dog source area. This information is then used as criteria for the selection of a suitable relocation site. Possible relocation sites will be analyzed using the above method, and Chi-square tests can be done to compare sites.

2. Relocation site that is similar in soil type and vegetation to the source site will be selected for this reintroduction project.

Release Site Preparation

1. Site will be mapped using GPS, and a map showing location of transects and prairie dog town will be made.

2. Transects will be established to monitor vegetation changes. Thirty-three meter point transects will be used to collect data on grasses and forbs. Line intercept will be used to collect data on trees and large shrubs. One set of transects will cover the release site and another set will cover the control site. A standardized method and data entry form will be made to collect transect data. Transects will be marked to establish permanency.

3. Site will be cleared by removing brush and mowing. Minimum area for the cleared site is 0.25ha (about 0.5 acres).

4. Poultry fencing (chicken wire) 0.9m (36in) high will be used to enclose the release site. T-posts will be placed 6m (20ft) apart. Two strands of slick or barbed wire will be attached to the T-posts, one strand at the bottom and the other at 0.62m (26in) from the ground. Chicken wire will be fastened to the slick or barbed wire. The top 0.25m (10in) will be loosely attached to every other T-post by a slack-wire, allowing the top of the chicken wire to fold inward when a prairie dog tries to climb over the fence. Chicken wire will be placed on the ground, with one edge attached to the bottom wire of the fence and the other edge staked to the ground. The ground fence will be partially covered with dirt and rocks.

5. A minimum of 10 starter burrows will be augered at least 1m deep at a 45 degree angle. If applicable, abandoned burrows may be augered. Cages will be set and staked over the starter burrows. Drione Insecticide powder containing 1% pyrethrines will be placed in the starter burrows.

Capture Site

1. The capture site will be observed to find optimum time for trapping prairie dogs. One to two weeks before capture, open baited traps will be set out to acclimate the prairie dogs. Based on observation, traps will be located to capture coteries.

At least 10 Tomahawk 6 x 6 x 14 x 1 inch-square mesh traps will be used, and 3-way sweet mix and/or carrots will be used for bait.

2. When the pups are able to forage on their own, traps will be baited and placed over the burrows for capture. Traps will be checked every two to four hours for captured animals.

3. People handling prairie dogs will wear protective clothing that covers most of their body (long sleeved shirts, long pants, boots and thick leather gloves). Insect repellent must be used as protection from fleas and ticks. Tetanus shots should be current.

4. Animals are left inside the traps and placed into sacks to reduce stress and calm them. Sacked prairie dogs are then placed into cardboard boxes for loading and transportation to the release site. Care will be taken to keep the animals comfortable and safe for the trip.

Release Site

1. Prairie dogs are unloaded and removed from boxes. While they are still in their cages they are sprayed with a water-based flea and tick mist.

2. Handlers will be clothed properly and use the same precautions that were used at capture site.

3. As animals are removed from traps they can be marked with Nyanzol D (black) dye. Consider marking the males to more easily monitor their activity. A mixture of 20 grams Nyanzol D per 1L of water is used to make the dye solution. A 2:1 mixture of hydrogen peroxide and water is needed to fix the dye to the animals' fur. The two solutions can be mixed together to facilitate the process.

4. Notify Texas Tech University in advance so they can have a person in the field, at this time, to take blood samples for DNA study.

5. Starter burrows may need to be dusted with Drione powder again, if it appears that other animals have been using the burrows since the site was prepared. Prairie dogs are released into the cages, with bottoms blocked by wire mesh, wood or metal to keep them in the cages for at least 3 days.

6. Do not put adult male prairie dogs in the same holding cage.

7. Check food (native forbs and 3-way mix), water and condition of holding cages as needed. Feed and water animals and make cage repairs at night. Minimize daytime disturbance of the relocated animals.

8. After at least three days, open the bottom of the holding cages to allow the animals to burrow out.

9. Remove the cages when it is apparent that the prairie dogs no longer need them. It will still be necessary to supplement the animals' diets with forage plants from the collection site.

10. When it appears that the relocated prairie dogs may have established a colony, the fence can be removed. This work should be done at night.

11. Supplemental work at the site after the fence is removed, such as feeding and expanding the cleared area by mowing, may be necessary until the animals adapt to the new site.

Monitoring

1. Human activity at the relocation site should be minimal. Prairie dog observation should be done at a sufficient distance not to disturb or stress the animals. A location should be found to establish a blind for animal observation.

2. Transect data will be collected at least annually from the prairie dog colony and control plot. Statistics used to compare changes will be mean. Standard error and chi-square will be used to compare sites.

3. Visual count for prairie dog population data should be done in May or June when the juveniles are above ground. Time of maximum prairie dog activity, according to Powell, *et al*. (1994), is 1.5 to 2.5 hours before sunset. It may be different for this area since it is farther south.

4. Visual monitoring for behavioral studies is optimum 2.5 hours after sunrise and 2 hours before sunset, but can be done any time the prairie dogs are above ground. Again these times are based on Powell, *et al*. (1994) and may be different for this area.

5. Visual data for associated animals will also be collected to monitor success of project.

6. Low impact camping, causing minimum disturbance to the park, will be done by personnel when needing to stay at the site overnight. Guadalupe Mountains National Park (GMNP) will specify a place to be used for this purpose.

7. Appropriate data collection forms and methods will be used to comply with GMNP 's requirements.

8. All field work, field trips or other activities by non-park persons (teachers, students, etc.) will be scheduled with GMNP in advance, and will be done at the discretion and convenience of GMNP personnel.

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