

MONITORING TRANSPLANTED POPULATIONS OF THE
UTAH PRAIRIE DOG (Cynomys parvidens)

Submitted to: Robert Hasenyager and
Michael Coffeen
Utah Division of Wildlife Resources

Principal Investigators: Dr. Jerran T. Flinders
Chairman
Department of Botany and Range Science
Brigham Young University

Howard C. Jacquart
Graduate Research Assistant
Brigham Young University

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INTRODUCTION

The Utah prairie dog (Cynomys parvidens) is the westernmost member of this genus. The range of the species is also the most restricted of all prairie dogs in the United States, found only in the southwestern quarter of Utah (Collier 1975). The Utah prairie dog was listed on the Department of the Interior's list of Endangered and Threatened Wildlife until May 13, 1983. At this time the U.S.F.W.S. reclassified the Utah prairie dog to threatened status (49CFR2330). The Utah Division of Wildlife Resources began prairie dog transplants in 1972 as a way to help private landowners with increasing prairie dog populations without an emphasis on transplant success. Better results were achieved in later years when emphasis was switched to transplant success (U.P.D. Recovery Plan, U.D.W.R. 1983).

It was decided at the 1983 Ad Hoc Utah Prairie Dog recovery team meeting that a greater emphasis should be shifted from moving large numbers of prairie dogs to conducting research on how to improve the success of the transplanted colonies. As a result this two year study is being conducted in cooperation with Brigham Young University, the Utah Division of Wildlife Resources, and the U. S. Forest Service, Fishlake National Forest (Loa Ranger District) to describe survival, dispersal and habitat interactions of transplanted Utah prairie dogs. Data obtained from this study will be used to improve success of future transplant operations for the species.

DESCRIPTION OF AREA

The study site is located 25 miles east of Loa, Utah on state road 72, T25S, R4E, on Tidwell Slopes of the Fish Lake National Forest (Figure 1). The topography of this site typifies a high mountain valley. The area consists of gentle rolling hills and valleys that range in elevation from 2707 meters to 2892 meters. Vegetation is dominated by sage brush with a mixture of grass and forbs understory. Average annual precipitation is 36 cms, much of which falls as snow. Daily maximum and minimum temperatures range from -28 C to -5 degrees C. in winter and 6 degrees C to 25 degrees C in summer months (U.S.D.A. SCS, 1979).

Dominant tree species include Quaking Aspen (Populus tremuloides), and Douglas Fir (Pseudotsuga menziesii). Shrub species include Big Sagebrush (Artemisia tridentata), Parry Rabbit Brush (Chrysothamnus parryi), Black Sage (Artemisia nova) Broom Snake-weed (Xanthocephalum sarothrae), Fringed Sage (Artemisia frigida) Gray Horsebrush (Tetradymia canescens), and Winterfat (Ceratoides lanata). Perennial grasses include Needle-and-Thread grass (Stipa comata), Alpine-Needle-and-Thread (Stipa pinetorum), Bottle Brush Squirreltail (Sitanion hystrix), Crested Wheatgrass (Agropyron crestatum), Western Wheatgrass (Agropyron smithii), Blue Grama (Bouteloua gracillis), Intermediate Oatgrass (Danthonia intermedia), Sandberg Bluegrass (Poa secunda), and Mutton Bluegrass (Poa fendleriana). Forbs include Western Yarrow (Achillea millifolium), False Dandelion (Agoseris aurantiaca),

Wild Onion (Allium acuminatum), Androsace (Androsace septentrionalis), Pussytoes (Antennaria rosulata), Snapdragon (Antirrhinum kingii), Western Purple Aster (Aster occidentalis), American Vetch (Astragalus), Rock Cress (Arabis drummondii), Indian Paintbrush (Castilleja chromosa) Fireweed (Epilobium latifolium), Fleabane (Erigeron eatonii), Yellow Buckwheat (Eriogonum umbellatum), Redroot Buckwheat (Eriogonum racemosum), Richardson Geranium (Geranium richardsonii), Scarlet Gilia (Gilia aggregata), Blue Phlox, (Linum perenne), Tailcup Lupine (Lupinus caudatus), Thorn Skeleton Plant (Lygodesmia spinosa), Bluebells (Mertensia ciliata), Locoweed, (Oxytropis viscidia), Mat Penstemon (Penstemon caespitosus), Wild Phlox (Phlox longifolia), Cinquefoil (Potentilla anseriana), Groundsel (Senecio multilobatus), Dandelion (Taraxacum officianale), and Goldeneye (Viguiera multiflora).

MATERIALS AND METHODS

The study site was selected with the cooperation of the Fishlake National Forest, within the historic range of the Utah prairie dog. The transplant site was prepared as previous transplant sites have been done by the Utah Division of Wildlife Resources (1978). Historical burrow mounds were manually cleared of vegetation that would restrict the vision of Utah prairie dogs. Two holes, approximately four inches in diameter, and three feet deep were augered approximately two feet apart in each of the historic mounds. Over each of these mounds a wire basket, 6' x 4' x 10" with a 2' x 3' opening in the bottom was placed and

securely anchored over the augered holes to serve as a temporary restraint to the Utah prairie dogs. Each basket had two doors in the top to release animals into. Fifty-one animals, as determined by the project proposal, were trapped at the Loa airport and Clem Okerlund's farm southeast of Loa using # 6" x 6" x 24" sherman traps baited with a mixture of oats and peanut butter. Sixteen of these 51 animals were radio instrumented, seven adult females, eight adult males, and one juvenile male. Transmitters were surgically implanted in the paritoneal cavity. Radio transmitters were equipped with mortality sensors to facilitate determining time of mortality. All Utah prairie dogs were ear tagged with color coded and numbered ear tags (red-adult male, blue-adult female, green-juvenile male, yellow-juvenile female). June release animals were also individually numbered using black hair dye. August released animals were not numbered with dye due to the lack of success in the June group.

Prairie dogs were anesthetized with a cocktail mixture of Acepromazine (0.04 cc/kg body weight) and ketamine hydrochloride (Ketaset) (0.30 cc/kg body weight) (Appendix ii) to reduce trauma from handling and to facilitate marking and measurement as well as radio instrumentation and dusting with a pesticide (Sevin). Sex, weight and relative age of each individual was recorded along with standard measurements (total, tail, hind foot, ear and zygomatic width). Before their release each instrumented animal was given a 1CC shot of flocillin to reduce occurrence of infection from the surgery.

These drug doseages and surgical procedures were experimentally performed on an adult male prairie dog provided by the Utah Division of Wildlife Resources prior to going into the field. No problems occurred with this animal.

Throughout the study period, (June-September) live trapping was done every two weeks to determine survival, dispersal, and body weight changes. In addition to live trapping an attempt was made to locate all released prairie dog with a spotting scope. All radio instrumented animals were located by triangulation and locations plotted on a map. This was done twice a day for the first 30 days and then once a day after the animals had stabilized.

Predators were controlled in the immediate study area. Raptorial birds were harassed with noise from gun shots with no intention to kill, badgers (Taxidea taxus) and coyotes (Canis latrans) were shot and/or trapped.

Dispersal was determined by locating individual animals each day with a spotting scope, surveying the area for new mounds, and locating the telemetered animals. Timing, direction of dispersal, elevational changes, and micro habitats were recorded for each animal.

Social activities such as warning calls, contact signals, physical contact and aggression were monitored daily. Five parameters of Utah prairie dog foraging activity were also recorded (when, where, duration, habitat and diet selections).

New burrow sites were analyzed for grasses and forbs using five Daubenmire (1959) sample plots on each of the four compass headings; N, S, E, and W for a total of 20 plots per burrow. Two point quarter (Mueller-Dombois and Ellenberg, 1974) plots were also analyzed on each compass heading for a total of eight per burrow for shrubs. The plant community for the total study site was characterized using a 50 x 100 meter plot. Fifty Daubenmire plots and 50 point quarter plots were read using a random distribution along lines that were spaced five meters apart over the length of the 100 m plot. Each of the ten random points along the five 100 m lines were determined using a random numbers table. Soil samples were collected on the surface and at a depth of 15 cms at ten randomly selected areas of the overall study site and at each new burrow which will be analyzed for texture and mineral content.

A Telonics model TS-1 Scanner/Programmer with companion TR-2 148/150 Receiver was used for locating instrumented Utah prairie dogs. A truck mounted whip antenna was used to obtain general locations and a hand held directional antenna was used to triangulate more precise locations.

Radio transmitters were surgically implanted into the inner paritoneal cavities of the prairie dogs. Initially mattress stitches with 000 cromatic sutures were used to close the incisions, but the prairie dogs were able to pick these sutures loose so 0000 cromatic sutures and retention stitches were used with no further problems. The radio transmitters were 2 1/2" x 1"

cylinders and each weighed 26 grams. Each transmitter broadcast on a different frequency allowing for individual identification of the animals. Each was also equipped with a mortality sensor. The range of the transmitters above ground and in a straight line of sight was approximately 2 kms. Below ground, after the animals had established their burrows, the range was restricted to 30 m and in one case only a few meters. This proved to be a major problem in locating animals. Monitoring the animals from higher elevations did improve the range of transmitters early in the season, but did not help after the animals had established their burrows. It was suspected that minerals such as Fe^{++} in the soil caused the restriction, however, this has not been confirmed.

RESULTS

Prairie Dog Releases and Dispersal

Once the transplanted prairie dogs were placed inside holding cages, their dispersal was thus artificially curtailed for several days in most cases. The idea being to give the animals time to acquaint themselves with their new surroundings and establish a burrow system within the release area.

Fifty-one animals that were released in June averaged the following weights; adult males 1218 g, adult females 695 g, juvenile males 299 g, and juvenile females 268 g animals

released in August averaged the following weights; adult males 1033 g, adult females 785 g, juvenile males 625 g, juvenile females 593 g (Table 1, 2 and 3).

Dispersal activity for the transplanted Utah prairie dogs began as soon as two hours after their release into the holding baskets. It took the prairie dogs an average of 24 - 36 hours to escape from the holding baskets. In all cases burrowing began almost immediately. This may, however, have been a panic response by the animals rather than a normal burrowing reaction. In all but one of the enclosures, escape burrows were excavated within 36 hours. These escape burrows consisted of one small burrow that was dug perpendicular to one of the artificial burrows usually midway down the burrow. Diameters of these burrows varied from 7 cms for juvenile animals to 10 cms for adults. The longest of these measured 5.2 meters from the artificial burrow. Measurements were taken above ground in a straight line distance from artificial burrow opening to the opening of the escape burrow. Most of the burrows were only long enough to allow escape from the basket. Escape burrows were never dug around the edges of the baskets. In two instances animals were seen crawling out of the tops of the baskets through the release doors.

In one incident after the basket was removed from a single group of three Utah prairie dogs that had made no attempt to burrow out, none of the three animals survived. All three were telemetered adult females. It is suspected the added stress from

weather conditions, transmitter implantations and/or poor body condition contributed to their death and lack of burrowing activity.

Once the prairie dogs were free from the baskets they began to disperse in what appeared to be a random directional pattern. However, their movements were toward areas of increased slope. Initially, a high percentage of the animals were seen close to their release areas, but only remained there for an average of four days. The animals used the artificial burrows and their escape burrows during their inactive periods for protection, but after seven days almost all (97%) of the artificial burrows had been abandoned. With only one exception none of these burrows were reused. During this time artificial burrows were not excavated other than the initial escape burrow. Since temperatures were often in the low 30's F during the morning hours many of the prairie dogs, especially juvenile animals, were very lethargic until temperatures warmed in the afternoon. These low ambient temperatures are normal for this area during this season (SCS 1979). Around each of the release areas several new burrows were found within three days after the release of prairie dogs. All were shallow, temporary burrows that were used only for short periods, usually less than three days, until the dogs moved to permanent burrows (burrows that were excavated by the animal and used for an extended period of time). Juveniles remained closer to their respective release areas than did adults. However, the high mortality of juveniles (49% confirmed mortalities in the

first 14 days) (Table 1) limited assessment of their dispersal patterns. Two adult males and one adult female (#13, #35, #49), never left the release area. Permanent burrows were established by these males within 2 - 3 weeks after release. After two months these burrows were deep enough to severely reduce the range of the radio signals.

Instrumented animals moved during daylight hours. Observations made during darkness (2200 - 2400 hours) during the first 21 days after releasing the animals failed to detect any movements.

Utah prairie dogs that were radio equipped were monitored very closely to determine their dispersal patterns. Of the seven instrumented adult females only one survived to fall hibernation.

Dispersal of Adult Females

Animal #45 (151.900) dispersed over 420 m the first day she was released (Figure 2). She was found under a rock outcropping 420 m north of her release point without a burrow. The second day she moved 1.17 km southeast remaining at the same elevation (2745 m) and established a burrow in an historic prairie dog mound. She stayed at this location for two days and then again moved further southeast and higher (2806 m) on the hillside before establishing another burrow on an open knoll 500 m from her initial burrow. She was not found on the fifth day. She may have moved out of radio range or been a victim of predation.

The only surviving female adult #49 (151.780) never left the release site (Figure 3). The farthest she was found from the release point was 250 m. She was only observed to use burrows that were already established by adult males and never excavated a burrow of her own. She would alternate burrows, averaging six days in each burrow. Generally she was alone in the burrows, but occasionally shared a burrow with an adult male. Several times she used more than one burrow during a 24 hour period.

Survival of the other five adult females averaged only five days (Figures 4, 5, 6, 7, and 8). None of these five left the release area. Two of the five did excavate burrows and were found in these burrows at the time of their death. These two burrows were both approximately 18" deep and consisted of one straight tunnel with no chambers. No autopsys were done on these animals other than to check the surgical incisions for infection and signs of other complications due to the surgical procedure. No sign of infection or other surgical related problems were detected.

Dispersal of Adult Males

The eight instrumented adult males also dispersed in an apparent random pattern. Each of these animals created a series of burrows along its dispersal path. Four of the eight males survived to fall hibernation.

Male #48 (151.480) dispersed the greatest distance (Figure 9). The first day after his release he moved 850 m west of

the release area and established a burrow on an historic prairie dog mound. The following day he moved 1.17 km further west. This dispersal required that he cross two ridges that were 215 m higher than the release area. He established a burrow on a bare knoll directly on the apex of a 2898 m knoll and spent three weeks at this location. He then moved 400 m further west and established a burrow on the south facing slope at 2806 m elevation. Twenty days later contact with him was lost. Due to the numbers of coyotes, golden eagles, and redtailed hawks seen in the immediate area, he was presumed to be a predator kill. His mortality was later documented when his radio was found 2.73 km away under a golden eagle's (Aquila chrysaetos) nest. At the time he was lost he had moved over three ridges and a total distance of 1.87 km from the release point through dense stands of Big Sagebrush and Quaking Aspen.

Male #13 (151.440) utilized a total of six burrows during the summer period (Figure 10). After his release he remained close to the retention enclosure for five days before moving. During this period he did excavate an escape burrow approximately 24 hours after being placed in the enclosure. After five days he moved 300 m to the northeast to a south facing slope and established a burrow. Eleven days later he moved 335 m east into a shallow sagebrush valley and established another burrow. He remained at this burrow for thirteen days before moving northwest 165 m and again established a burrow. Thirteen days later he established another burrow. Then after thirteen days returned to

the artificial burrow where he had been released 42 days earlier. Over the remaining summer he alternated using three burrows within the release area. Frequently he was observed in more than one burrow within a one day period. These burrows were always ones he had excavated previously. He was never found in another animal's burrow, and finally went into hibernation less than 100 m from where he had been released.

Male #5 (151.420) was released June 27 and was found dead on July 8. He had moved 200 m east of his release site and excavated one burrow (Figure 11). He was found dead in this burrow. This burrow was very shallow being less than .5 m deep.

Male #35 (151.431) was released on June 27 (Figure 12). Twenty-four hours after his release he had left the enclosure, but stayed close to the enclosure for three days to utilize the artificial burrow. He then moved 180 m to the southeast and utilized an abandoned badger hole for two days, he then moved 100 m to the west and excavated a burrow. Twelve days later he moved north and established a burrow on a historic mound 50 m north of his release point, but stayed there only five days. He then moved 330 m south and established a burrow on a south facing slope 875 m north of the road. Twenty-six days later, after a heavy rainstorm, he again moved south 330 m and established a burrow in an historic mound. Seven days later he moved to a burrow 155 m north, but immediately returned to the previous burrow the following day. On September 4 he hibernated in this burrow 500 m from his release point. This animal never returned

to any previously constructed burrows throughout the summer. Once he left a burrow with the exception of his last burrow, he never returned. He was never observed utilizing another animal's burrow.

Male #41 (151.140) was released on June 28 (Figure 13). Twenty-four hours later he escaped from the enclosure. One day later he was 810 m south of the release area on a north facing sage hillside in a burrow he had excavated. He stayed at this location for five days. On July 5 he was found dead 155 m east in a grove of quaking aspens curled into a ball and buried under leaves. It was suspected that this animal died of exposure since extremely heavy thunderstorms were experienced on this day. No sign of surgical complications were evident.

Male #30 (150.970) was released on June 27 (Figure 14). He left the basket on June 28, but remained close to the basket utilizing the artificial and escape burrows until July 3. At this time he moved 529 m southeast and established a burrow. This burrow was used only one day before he moved approximately 420 m further southeast. He again excavated a burrow, and remained at this location for 14 days. He then moved approximately 1 km northwest back to the release area and excavated a burrow that he used for seven days. He then excavated another burrow 150 meters southeast of this burrow and remained there for 16 days. On August 13 he moved high on the bench 520 m northeast to an elevation of 2769 m and excavated a shallow burrow in very rocky soil. Two days later he left this burrow and moved

south to within 200 meters of his release point. He excavated a burrow at this site and went into hibernation sometime between September 4 and 16. A total of seven burrows were excavated from the time of his release until he entered hibernation.

Male #43 (150.110) was released June 28 (Figure 15). Less than three hours after his release he was seen outside the enclosure. Twenty-four hours later he had moved 155 m to the north and had excavated a burrow. Twenty-four hours later he had moved 1.24 km to the southeast and established a second burrow at 2806 m on a south facing slope. Eight days later he moved 320 m to the west and excavated a burrow. The following day he moved south 320 m and established a burrow on the north side of a grove of aspens. Twenty-three days later he moved 100 m north and established a burrow that he stayed in for 10 days before moving back to the burrow by the aspens. He remained there until going into hibernation.

Male #50 (151.016) was released July 8 (Figure 16). He immediately climbed out of the enclosure and moved 500 m south where he established a burrow on the valley floor. He remained at this burrow until he was killed on July 12 by a badger trap 100 m from his burrow.

Male #31 (150.292), a juvenile male, was instrumented, but died three days after his release without leaving the release area. It was suspected that his death was caused by the stress of surgical procedure combined with harsh weather conditions. (Figure 17).

The 22 animals that were released in August were not observed to experience the high initial mortality rate that the June group experienced even though weather conditions were still harsh. However, it is unknown how well they survived the winter of 1984-85 (Table 3). These animals remained closer to the release area and seemed to be more content to stay at the release site despite the fact they were released without using enclosures. Following their release they were seen utilizing burrows that had been excavated by the previous group of transplanted animals, as well as numerous burrows they had excavated themselves. Two weeks after their release the second group of animals had dispersed over an area approximately 325 m² and established many new burrows (Figure 18).

Mortality and Predation

Badgers have historically been a major predator of relocated Utah prairie dogs (Collier and Spillett 1972). During this study period badgers were not a significant cause of mortality for prairie dogs. During the 1984 study an attempt was made to remove all badgers within a 1.6 km radius of the release site. The trapping efforts resulted in three badgers being controlled, one adult male and two adult females. One badger was shot within the boundaries of the study area. Before he was killed he did excavate one prairie dog burrow where the animals were living. All four of the badger stomachs were examined for prairie dog remains. Only the badger shot in the study area contained prairie dog remains in its stomach.

The remains of one adult male prairie dog, #48, were found along with the radio transmitter under an eagle's nest approximately 2.73 km from the release site. This male had dispersed further than any of the instrumented animals previous to its disappearance (see pg. 11) (Figure 9.).

Coyotes were present at the study site, but were never observed to actively hunt the prairie dogs. Four coyotes were controlled during the summer as a precautionary measure. Two juvenile males, one juvenile female and one male adult. The stomach contents of each were examined; none contained prairie dog remains.

A major cause of mortality was thought to be harsh weather conditions that occurred shortly after release of the animals. Twenty-five animals, out of the original 51 released (49%) (7 adult females, 9 juvenile males, 7 juvenile females, 2 adult males), were recovered in the first ten days following their release. Heavy thunderstorms with hail and temperatures that never reached above 50 degrees F were suspected to contribute to this mortality (Appendix i). Juveniles that had escaped from the baskets were caught in the open without any cover during these thunderstorms. All animals found under these conditions eventually died. Four juveniles were also found dead in the artificial burrows. After the initial high mortality rate of the first two weeks confirmed mortalities decreased markedly. This is suspected to be a result of animals dispersing away from the release site and is not suggesting that animals were surviving

at a higher rate. Observations throughout the summer in the surrounding 2 km² area outside the initial release area resulted in no sightings of prairie dogs.

August transplanted animals were not observed to be effected by the harsh weather conditions. No dead animals were found on the release site as was found during the June transplant.

Social Interactions

No groupings of animals occurred until two weeks after their release. Initially all animals kept to themselves. After acclimating to their surroundings, usually in 2 to 3 weeks, they began forming pairs and small groups. Adult prairie dogs tended to be more solitary than did the juveniles. Adult males were rarely seen together and tended to stay by themselves. Adult females did associate with juvenile animals, but never on a permanent basis. Juveniles of both sexes were often seen in pairs and small groups. Except for three adult females, which remained solitary, most formed pairs and tended to stay close to the same animals for the entire summer.

No aggressive interactions were ever witnessed between the prairie dogs. The only act of aggression witnessed occurred when a Uinta ground squirrel (Spermophilus armatus), invaded a freshly excavated mound of one of the adult males. The ground squirrel was immediately confronted by the prairie dog and driven away. This was the only time any type of prairie dog vocalization was heard. Shortly after the ground squirrel had been driven off the male prairie dog gave a sharp bark and strutted around his mound

characteristic of a dog marking its territory. No alarm system was ever established at the transplant site. No alarm type calls were ever heard once the animals were released.

Animals that were introduced to the transplant site in August were readily accepted by the previously transplanted animals. No aggression was witnessed between these two groups of animals. These relocated animals seemed to accept the release site quicker than the initial group. These newly transplanted animals were seen in association with animals from the first transplant as soon as one day after their release. This may have been the result of having some burrows already established in the area allowing the newly introduced animals to use them for cover.

Animals from both groups were seen utilizing the same burrows at the same.

Foraging Activity

Both transplant groups were seen foraging within one day of their release. Instrumented animals were commonly seen up to 200 meters from burrows they had utilized the previous night. These animals were usually found in the same burrows the following night indicating a willingness to forage considerable distances.

Foraging began immediately upon leaving their burrows in the morning and occupied approximately 50 percent of their time during active periods. These active periods varied with different seasons. Early in the summer the animals exhibited a bimodal pattern of activity which coincided with daily variances

in temperature (Appendix i). During this period animals were active from just after sunrise and down around noon. They reappeared in late afternoon and stayed up until sunset. Later in the summer these active periods switched to a unimodal pattern with animals active from sunrise to sunset.

Vegetation

The study site into which the prairie dogs were relocated was characterized by 7 species of shrubs, 8 species of grasses, 1 species of sedge and 18 species of forbs. The total density for all species of shrubs at the release site was 2.15 per square meter. Densities ranged from 0.91/m² for Parry Rabbitbrush, 0.89/m² for Big Sagebrush, 0.27/m² for Winterfat, 0.05/m² for Fringed Sage, 0.045/m² for Gray Horsebrush and 0.043/m² for Black Sage. Parry Rabbitbrush exhibited the highest frequency occurring in 84 percent of the sample plots, Big Sagebrush occurred in 82 percent, Winterfat occurred in 26 percent, Gray Horsebrush in 26 percent, Black Sage in 1 percent and Fringed Sage in 1 percent. Average shrub height varied from 25.8 cm for Parry Rabbitbrush, 19.6 cms for Big Sagebrush, 22.8 cms for Winterfat, 18.3 cms for Gray Horsebrush, 16.1 cms for Fringed Sage and 9.7 cms for Black Sage.

New burrow sites were located in areas having a density of 1.87 shrubs per square meter (Table 4). Densities ranged from 0.80 plants per square meter for Parry Rabbitbrush, 0.51 per square meter for Big Sagebrush, 0.50 per square meter for Fringed Sage, 0.41 per square meter for Winterfat, 0.07 per square meter

for Gray Horsebrush and no Black Sagebrush. Frequency of occurrence was highest for Parry Rabbitbrush which occurred in 91 percent of the plots, Big Sagebrush in 77 percent, Winterfat in 71 percent, Fringed Sage in 60 percent, Gray Horsebrush in 3 percent and no Black Sage. Average shrub height near the new burrows ranged from 12.3 cms for Parry Rabbitbrush, 11.8 for Winterfat, 11.7 cms for Big Sagebrush, 11.0 cms for Gray Horsebrush and 5.2 cms for Fringed Sage.

Total grass and forb cover at the release site was 39.9 percent. Forbs comprised 27.7 percent of the cover and grasses 12.2 percent. New burrows were located in areas having a 36.9 percent total cover for grasses and forbs, with grasses comprising 13.5 percent and forbs 23.4 percent. Table 6 presents a detailed breakdown of percent cover by plant species.

Slope at the release site varied from less than 5 percent to 10 percent. Slope at new burrow sites averaged 9 percent.

DISCUSSION

These preliminary results suggest that Utah prairie dogs released early in June in this habitat type (high altitude subalpine shrubland meadow) have low survival of juveniles and adult females. The high mortality rate appeared to be directly related to severe weather conditions immediately following their release. Predation was not a major cause of mortality, with only two confirmed losses due to predation. Adult males had a high survival rate in spite of the severe

weather conditions. The ability of adult males to survive better may be attributed to their better body condition. All telemetered adult males had ample body fat to carry them until they were able to establish new burrows. Crocker and Bedford (1975) reported adult females required twice as much energy per day during the lactation period. The adult females released at this site during June were devoid of any reserve fat. Several of these adult females were still lactating when captured and relocated. Cold and wet weather may have synergistically affected the overall condition and survival of the animals. Juvenile males and females weighed an average of 283 g and had no reserve body fat. Absence of body fat combined with a lack of an established burrow system and stress from relocating may be more than they can survive.

Animals released in August were in much better condition than those released in June, averaging 326 g heavier for juveniles and 90 g heavier for adult females (Table 5). None of the adult females were lactating at this time. Delaying relocation efforts until August allowed animals to gain the weight needed to help them withstand the stress encountered during relocation. Weather conditions, although still cold and wet, were not as severe as those experienced in June (Appendix i). Juveniles were larger and able to establish burrows easier without having to rely on adult animals to do it for them. These animals exper-

experienced lower mortality, probably because of improved body condition and milder weather conditions during their initial re-establishment period.

Social interaction was very limited. Animal densities were so low the chance of finding another animal was minimal. Animals that did make contact were often seen together throughout the summer. Animals introduced to the same area during August were readily accepted by the previous group. The later group of animals did not disperse as far as the original group.

Even after the animals began using burrows on a consistent basis no alarm system was established. Animals would watch as the biologist walked through their burrow area and hide, but never used alarm calls. It is important to determine how long it takes a relocated population to establish a vocal alarm system and conspecific expressions of territoriality.

Food was not a problem for relocated animals. Weight gains through the summer indicated that animals were readily taking available forage. Animals were seen foraging as soon as they were free from the enclosures. They spent much of their time foraging.

Dispersal of prairie dogs was widespread and probably contributed to the high mortality. Animals would leave the artificial burrows and head out on their own. During this time frequent severe thunderstorms often caught the animals having nowhere to go for shelter. This was verified by the number of animals found dead in the open after these storms. This large-

scale dispersal also removed animals from any future reproductive population even if they had survived. Some prairie dogs traveled over 1.6 km in less than three days.

The surgical procedure for instrumenting the animals was successful. Only one animal, an adult male, died during the surgical procedure. His death was suspected to have been caused by a reaction to the ketamine hydrochloride. The other prairie dogs exhibited little if any problems with the surgery. All animals were ready to be released within 48 hours of surgery. Initially, animals were easy to locate, but as more burrows became established, locating prairie dogs became increasingly difficult. In late summer when animals were utilizing more than one burrow, locating them during periods of inactivity was successful only by knowing which burrows they used and checking each of them. Radio signals could only be detected within 30 m of the occupied burrow. During prairie dog activity periods radio signals were often received as far away as 3 km. The difficulty in locating dogs that were in burrows reduced the chances of finding animals that had moved.

Vegetation differences between the release site and sites selected for new burrows were slight. The only plant species in significantly higher frequencies near new burrow sites was winterfat. It's occurrence increased by 65 percent at new burrow locations. Shrub density differed by only 0.28 shrubs per square meter, with new burrows located in areas slightly more open. Shrub height averaged 8.3 cms less at new burrow sites

than at the release area (Table 4). Differences between percent cover was not significant nor was percent of grasses vs forbs between area (Table 6).

Animals tended to construct new burrows in historical mound sites, or on south facing slopes that provided them with an acceptable observation point. Since vegetation was so similar between the release area and the new burrow sites, vegetation probably was not a primary factor influencing selection of new burrow sites. Slope and overall field of vision appeared more important in site selection. The animals foraged several hundred meters from their burrows so immediate access to food was not necessary.

Marking procedures proved satisfactory except for the hair dye. Dye marks were worn off all 50 animals within seven days of their release. Ear tags were easily identified only within 100 m with a 20X spotting scope. Yellow ear tags blended into the animals hair making them very difficult to identify. Orange tags were by far the most visible. In low light ear tag colors were difficult to discern. No ear tags were lost or torn from ears recaptured animals.

There did not seem to be any problems with the animals adjusting to the radio implants. The transmitters did not seem to restrict the animals in their movements or burrowing activities. All but one of the instrumented animals were released within 48 hours after implantation. Release of one was delayed because it picked out its stitches.

PRELIMINARY CONCLUSIONS

1. Early season prairie dog transplants at this altitude should be done with adult males. In August adult females and juveniles should be transplanted. Burrows established by the adult males will help the survival of females and juveniles.
2. Juveniles survived better if given a chance to grow and put on additional body weight prior to relocation. Older and larger juveniles were able to excavate their own burrows rather than relying on adults.
3. Adult females survived better when introduced later in the summer, probably due to better body condition.
4. Prairie dogs introduced to a newly established colony were readily accepted by colony members.
5. Prairie dogs preferred south facing slopes and historical mounds to artificial burrows.
6. Distance of dispersal from release sites is a critical factor in determining whether a new population will be viable.
7. Weather influences survival of introduced prairie dogs until they can construct permanent burrows.