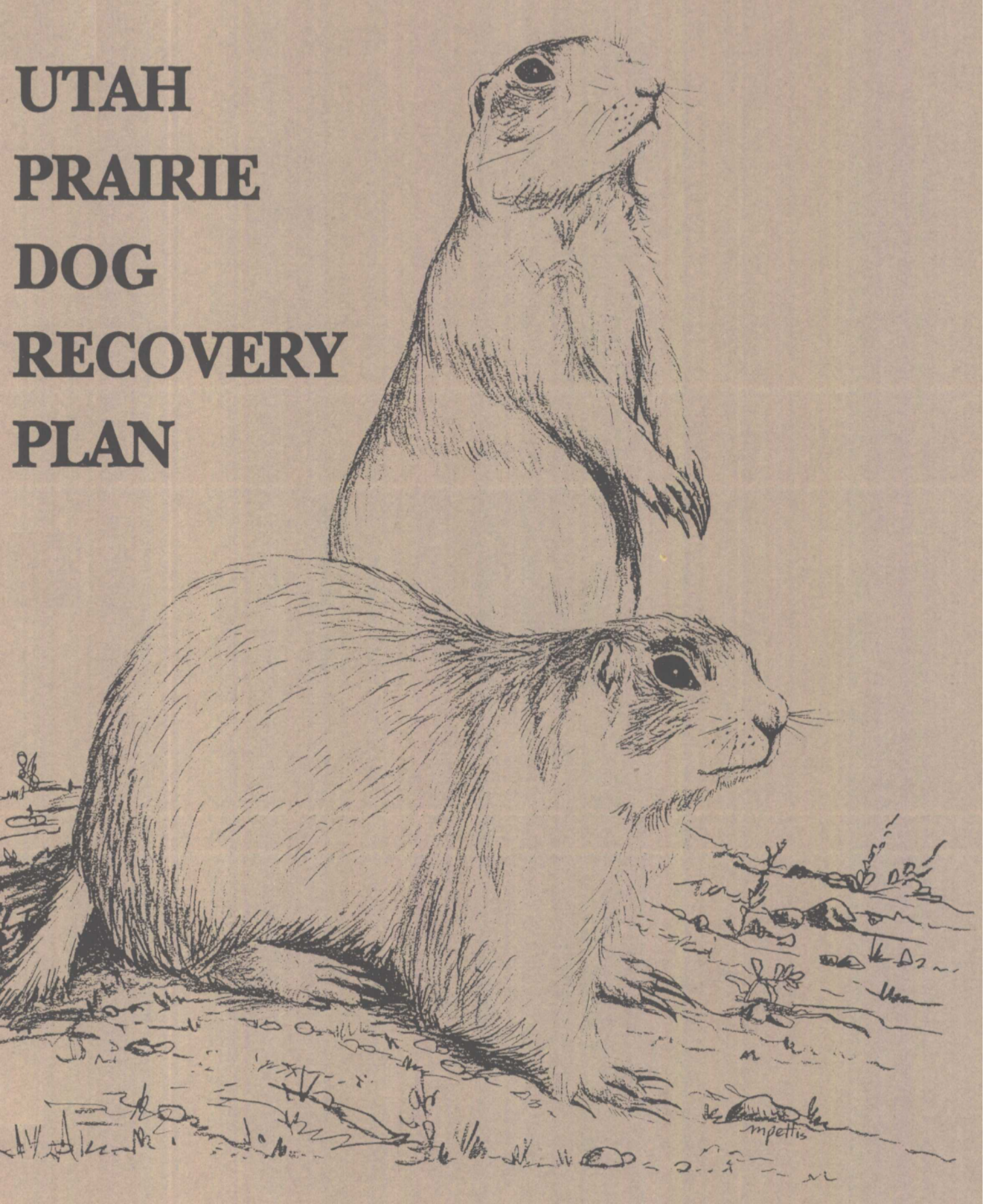
UTAH PRAIRIE DOG RECOVERY PLAN



UTAH PRAIRIE DOG
RECOVERY PLAN

Prepared by

Utah Division of Wildlife Resources
Salt Lake City, Utah

and

Region 6
U.S. Fish and Wildlife Service
Denver, Colorado

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Regional Director, Region 6

Date: 9-30-91

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Recovery plans delineate reasonable actions which are believed to be required to recover and/or protect the species. Plans are prepared by the U.S. Fish and Wildlife Service, sometimes with the assistance of recovery teams, contractors, State agencies, and others. Objectives only will be attained and funds expended contingent upon appropriations, priorities, and other budgetary constraints. Recovery plans do not necessarily represent the views nor the official positions or approvals of any individuals or agencies, other than the U.S. Fish and Wildlife Service, involved in the plan formulation. They represent the official position of the U.S. Fish and Wildlife Service only after they have been signed by the Regional Director or Director as approved. Approved recovery plans are subject to modification as dictated by new findings, changes in species status, and completion of recovery tasks.

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U.S. Fish and Wildlife Service. 1991. Utah prairie dog recovery plan. U.S. Fish and Wildlife Service, Denver, Colorado. 41 pp.

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ACKNOWLEDGEMENTS

The U.S. Fish and Wildlife Service and the Utah Division of Wildlife Resources express their appreciation to the following people who helped draft this plan by offering comments and suggestions.

Robert N. Hasenyager, Coordinator, Utah Division of Wildlife Resources
Tom Ball, Bureau of Land Management
Tim Clark, Idaho State University, Department of Biology
Greg Clevenger, U.S. Forest Service
Mike Coffeen, Utah Division of Wildlife Resources
Don Collier, John C. Calhoun State Community College
D. Coleman Crocker-Bedford, U.S. Forest Service
Steve Hedges, Bureau of Land Management
Al Heggen, Utah Division of Wildlife Resources
Tom Henry, National Park Service
Gerry Hoddenback, National Park Service
Phil Janik, U.S. Forest Service
Clair Jensen, Utah Division of Wildlife Resources
Linda Kerr, Bureau of Land Management
E.J. "Bert" Lowry, U.S. Forest Service
Phil Mooney, U.S. Forest Service
Jordan Pederson, Utah Division of Wildlife Resources
Rod Player, Utah State University, Range Science Department
Paul Sawyer, Bureau of Land Management
Bill White, U.S. Fish and Wildlife Service
Mary Ann Wright, Utah Division of Oil, Gas, and Mining

A special thanks to Marianne Lamarra for preparation of the introduction and to Margaret Pettis for the cover art work.

EXECUTIVE SUMMARY

Current Status: The number of Utah prairie dogs was estimated to be 95,000 animals prior to control programs in the 1920's. By the 1960's, the Utah prairie dog species distribution and numbers were greatly reduced due to disease (plague), poisoning, drought, and human-related habitat alteration resulting from cultivation and poor grazing practices. The Utah prairie dog was listed as an endangered species on June 4, 1973 (38 F.R. 14678). Because of the improved status of the species and the overwhelming increases seen on private lands since 1976, the U.S. Fish and Wildlife Service reclassified the species to threatened on May 29, 1984.

Habitat and Limiting Factors: The Utah prairie dog inhabits arid grassland in southwest Utah. Habitat loss and poor habitat quality are immediate concerns for the remaining Utah prairie dogs. Most of the species distribution occurs on private lands which are or will be largely developed for agricultural production or housing. Long-term overgrazing on prairie dog habitat has caused a great reduction in habitat quality and a reduction in moisture availability in the vegetation. The western portion of the species historical range also has become less favorable due to higher temperatures and a drier climate.

Recovery Objective: Delisting.

Recovery Criteria: To establish and maintain the species as a self-sustaining, viable unit with retention of 90 percent of its genetic diversity for 200 years. This can be accomplished by 1) establishing and maintaining one population each on public lands in the West Desert, Paunsagunt Area, and Awapa Plateau; 2) maintaining each population with a minimum number of 813 adult animals in the annual spring census; and 3) establishing and implementing a formal Memorandum of Understanding for long-term management of each population, including the transfer of animals between populations for genetic purposes.

Actions Needed:

1. Determine historical range and species distribution.
2. Continually update information on present populations and distributions.
3. Determine what factors influence the viability of prairie dog colonies.
4. Select management and transplant sites.
5. Conduct transplant program.
6. Monitor transplanted colonies.
7. Ensure protection of prairie dogs and their habitat on both existing and transplant sites on public and private lands.
8. Manage prairie dog colonies by developing and implementing site-specific management plans for each colony or transplant site.
9. Conduct an information and education program.

Date of Recovery: 2000.

Total Cost of Recovery: $950,000.

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GLOSSARY

The consistent use of animal grouping terminology is important to eliminate confusion when discussing the Utah prairie dog. Terms such as towns, colonies, complexes, and populations have been used interchangeably in the past. The following definitions will be used throughout this Recovery Plan:

Colonies are groups of animals with associated mounds, burrows, and food resources that are within calling distance. These units are genetically similar and vulnerable to local catastrophies including disease outbreaks.

Complexes are groups of colonies that are within 2 miles (3.2 kilometers) of each other, not separated by geographic barriers, and that will exchange migrants each one to two generations.

Populations are groups of complexes within a geographic area that are not separated by geographic barriers but are generally separated by distances greater than 2 miles (3.2 kilometers). With colony growth and extension, the complexes can potentially exchange migrants every few generations. With a decline in numbers, a population has the potential for becoming a complex. Disease vulnerability will become greater if the population does become a complex.

Public land is that land administered by land management agencies such as the Bureau of Land Management, National Park Service, and Forest Service. When this recovery plan was originally written, this designation also included all lands administered by the State of Utah. The State informed the Fish and Wildlife Service on July 25, 1991, that those lands known as school or institutional trust lands are to be considered as private land and are not to be used for Utah prairie dog transplant sites. Appendix C includes all State lands as public land and, due to short time frames and complexity involved, could not be revised to reflect the change. Future revisions of this Recovery Plan will more accurately reflect land status.

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PART I

INTRODUCTION

Description

Taxonomically, prairie dogs (Cynomys spp.) are divided into two subgenera: the white-tail and black-tail. The Utah prairie dog (Cynomys parvidens) is a member of the white-tail group, subgenus Leucocrossuromys. This subgenus is distinguished by a relatively short (1.2 to 2.4 inches [30 to 60 millimeters]) white-tipped tail (Durrant 1952; Pizzimenti and Collier 1975).

The Utah prairie dog's general color is cinnamon to clay with distinguishing markings of dark brown above and below the eyes and white on the end of the tail. Individual body hairs of the Utah prairie dog are multicolored. From base to tip, they are black, pale buff, cinnamon, and tipped with dark brown or pale buff. Spots above and below the eyes of the Utah prairie dog are dark brown, the mouth and chin whitish, and the underparts cinnamon to pale buff (Durrant 1952).

The ranges for measurements of adult Utah prairie dogs are: total length, 12 to 14 inches (305 to 360 millimeters); tail, 1.2 to 2.4 inches (30 to 60 millimeters); hind foot, 2.2 to 2.6 inches (55 to 66 millimeters); and ear, .5 to .6 inches (12 to 16 millimeters). Utah prairie dogs have five pairs of mammae, two pectoral, and three inguinal (Pizzimenti and Collier 1975).

Utah prairie dogs probably shed twice a year. During the transition from summer to winter pelage, the pattern is relatively indistinct. White-colored juvenile pelages have been reported but are considered abnormal (Kelson 1951). Two other species of white-tail prairie dogs (C. gunnisoni and C. leucurus) occur in Utah. Utah prairie dogs can be distinguished from them by their cinnamon to clay coloration of the dorsum and the proximal half of the tail. They have sharply outlined black "eyebrows" which are lacking in other species (Pizzimenti and Collier 1975). The type locality for this species was from Buckskin Valley, Iron County, Utah (Allen 1905).

Chromosomes of the Utah prairie dog have been compared to those of the other two Utah species. These studies indicate that C. leucurus and C. parvidens are closely related and once may have belonged to a single interbreeding species. Because no integration between the species has been found, genetic integrity has apparently been maintained. There is no evidence that C. parvidens and C. leucurus represent a polytypic species (Pizzimenti and Nadler 1972).

A study by Chesser (1984) on Utah prairie dog populations indicated a lack of genetic variability in C. parvidens. He also states that, "Although . . . the social structure of prairie dog populations helps to preserve genetic variation within and among populations, it also has the effect of greatly diminishing effective population size. Thus, when populations are very small, social organization would have an opposite effect in that genetic drift may occur more rapidly and genetic variation is lost very quickly. Although the Utah prairie

dog is not as socially organized as the black-tail prairie dog, the combination of potential factors outlined above could have resulted in the loss of genetic variation in C. parvidens."

History

Fossil records indicate that prairie dogs did not branch off from the spermophile line until late in the Pliocene period. Several Pleistocene prairie dogs have been described, but there is no evidence that Cynomys existed prior to this time. Clark et al. (1971) reports that the earliest prairie dog appears to be C. meandensis from the Deer Park fauna of the early Pleistocene period (10,000 to 1 million years ago). Prairie dog bones excavated from two Fremont village sites near Cedar City, Utah, have been dated between 500 AD and 1300 AD (Pizzimenti and Collier 1975).

Historical records prior to the white man's expansion into the West indicate that prairie dogs inhabited thousands of acres, primarily within the Great Plains. An ecological relationship apparently existed between bison (Bison bison) and prairie dogs. Bison moved constantly, seldom overgrazing, and the prairie dog populations were large but stable. Much short grass habitat was maintained, interspaced with patches of forbs and bare ground. This type of habitat was ideal for both species (McNulty 1970). The near extermination of bison on the Great Plains resulted in changing plant succession (Egoscue 1975). When cattle replaced the bison, they overgrazed the range and removed existing areas of tall grass. The additional short grass habitat which resulted from this overgrazing by cattle allowed for large increases in prairie dog numbers (Osborn and Allen 1949). Seton (1909) estimated the range of the black-tail prairie dog to be about 600,000 square miles (1,554,000 square kilometers) during the late 1800's, an area that may have held a billion prairie dogs.

Livestock operators with the assistance of the Federal Government began poisoning prairie dogs around 1880, and rodent control campaigns still continue throughout the West. Because of the concerns of mammalogists, the Leopold Board was appointed by Secretary of the Interior Udall in 1963 to investigate wild animal controls. This committee soon discovered that it was impossible to ascertain the real extent of poisoning, trapping, and shooting because of the number of individuals, agencies, and programs involved in extermination (McNulty 1970). However, Agency records maintained by the U.S. Fish and Wildlife Service from 1917 to 1960, then the Bureau of Sport Fisheries and Wildlife, give an indication of population sizes involved and the intensity of poisoning campaigns. Annual report data on rodent control efforts in Utah extend back to 1917. This information is summarized in the following paragraphs.

The first report of measures to control prairie dogs in the historical range of C. parvidens was made in the 1920 Annual Report. Successful (but unreported) control efforts taken prior to this date had "lessened" the problem in this region.

However, 5 years later, populations of Utah prairie dogs were apparently on the upswing. "Infestations" were reported in seven counties in 1925, with Garfield County apparently having the largest infestation of Utah prairie dogs. From 1925 to 1933, detailed records (by species) were kept on control efforts taken in each county. Data were kept on items such as the number of "infested acres" for each rodent species, the number of acres treated, and pounds of poisoned bait used for each rodent species. Counties treated within the Utah prairie dog's range include Garfield, Iron, Piute, Sevier, and Wayne. "Infestations" were reported in Beaver and Kane Counties, but no control measures were reported. A maximum of 507,000 acres (205,176 hectares) in Garfield County were occupied by Utah prairie dogs in 1933 (appendix A).

Poisoning efforts by the Service in Utah were concentrated on National Forests such as Dixie, Powell, and Fishlake. Fishlake National Forest lands in Sevier County had particularly high populations and considerable effort was directed toward "exterminating" prairie dogs in this area. In 1921, approximately 10,880 acres (4,403 hectares) were retreated with strychnine and 16,000 additional acres (6,475 hectares) within the forest were poisoned. Treatment of the Fishlake National Forest was repeated again in 1924, with "retreating and cleanup work" being carried out once more in 1936.

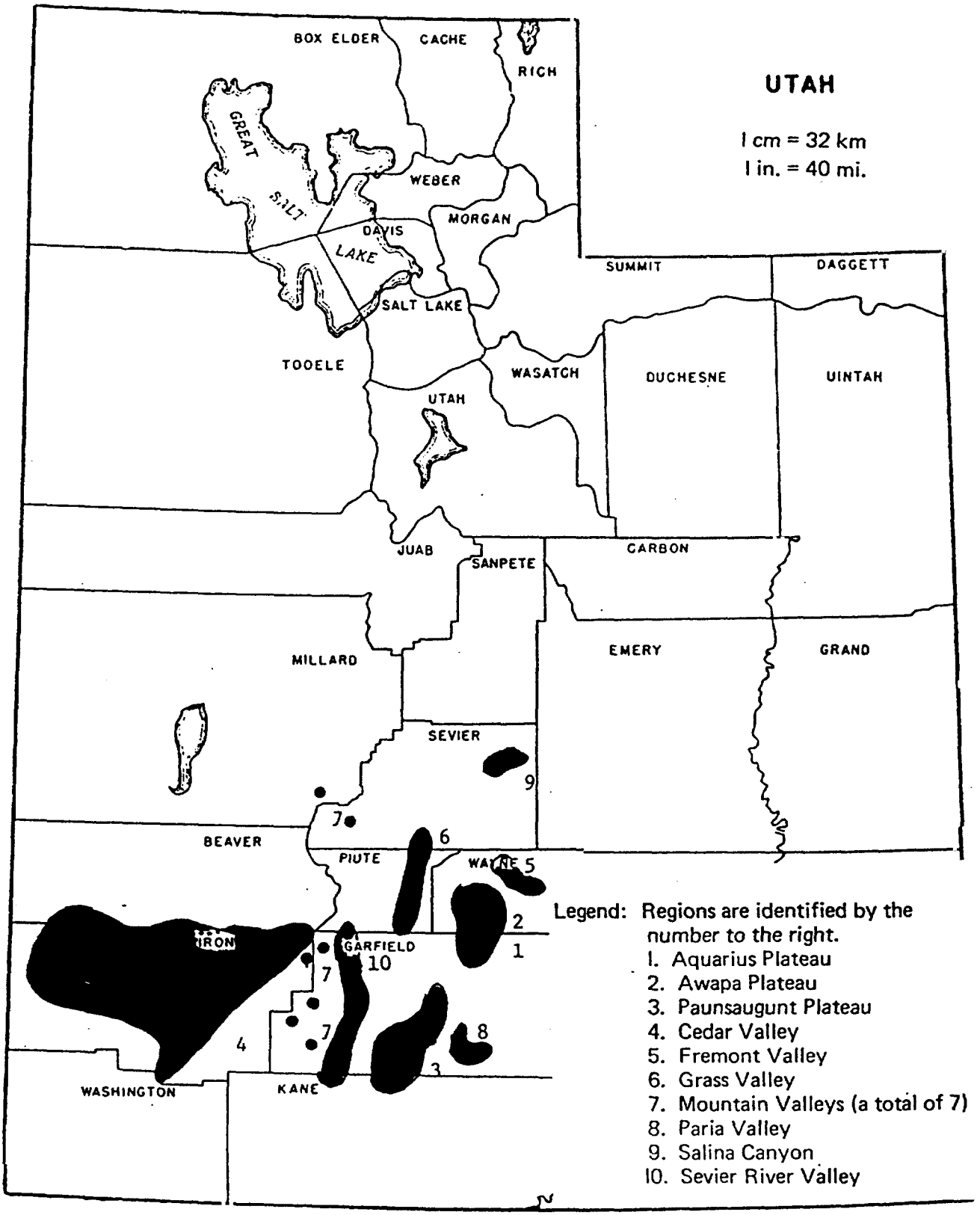
Plague (Yersinia (=Pasteurella) pestis) was reported in rodent populations in the Widtsoe Valley area of Garfield County in 1937. Only 353 pounds (160 kilograms) of poisoned bait were required that year to cover 9,560 acres (3,869 hectares) in Widtsoe Valley and Johns Valley. The rationale for using this small quantity of bait was the "sparsely and spotted condition of infestation."

Species Status and Distribution

The Utah prairie dog is the westernmost member of the genus Cynomys. The species' range, which is limited to the southwestern quarter of Utah, is the most restricted of all prairie dog species in the United States. As could best be ascertained by Collier (1975), the species' distribution was much broader prior to control programs and at one time extended across the desert almost to the Nevada-Utah State line. Utah prairie dog colonies were found as far west as Pine and Buckskin Valleys in Beaver and Iron Counties (Allen 1905), as far north as Nephi, Utah (Hollister 1916, Durrant 1952), southeast to Bryce Canyon National Park (Presnall 1938), east to the foothills of the Aquarius Plateau (Tanner 1940), and south to the northern borders of Kane and Washington Counties (Figure 1). There is some question if the Utah prairie dog actually occurred as far north as Nephi because no voucher specimens are known for that area (Pizzimenti and Collier 1975). The Uinta (Spermophilus armatus) and Townsend's ground squirrels (S. townsendii) are commonly referred to as prairie dogs by the local residents in the Nephi area (Pizzimenti and Collier 1975).

At one time, the species occupied about 700 sections in 10 areas of southwestern Utah. However, estimates of the size of former populations are difficult to make. The total number of Utah prairie dogs was estimated to be 95,000 animals prior to control programs in the 1920's (Turner 1979). The

Figure 1. Range of the Utah Prairie Dog prior to control programs (drawn from Collier 1975)



estimate was based on interviews with residents in southern Utah and estimates of populations from old colonies that were known to have been inhabited at one time (Collier and Spillett 1973).

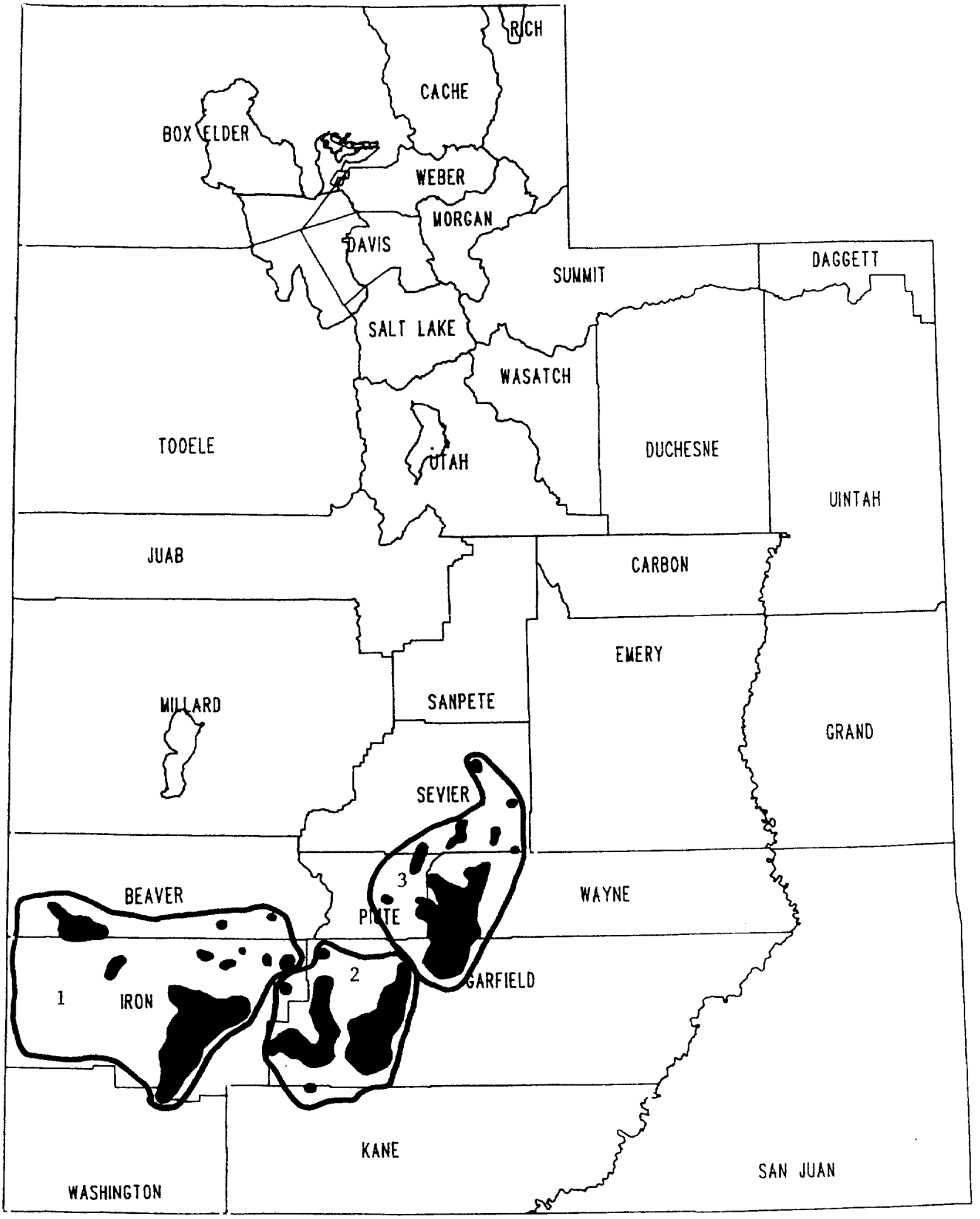
By the 1960's, the Utah prairie dog species' distribution was greatly reduced due to disease (plague), poisoning, drought, and human-related habitat alteration resulting from cultivation and poor grazing practices. Studies by Collier and Spillett (1972) indicated that the Utah prairie dog had declined or been eliminated from major portions of its estimated historical range. By 1972, they estimated that there were 3,300 Utah prairie dogs in 37 separate prairie dog colonies. It appeared from this estimate that the Utah prairie dog would be extinct by the year 2000 (Collier and Spillett 1973).

The Utah prairie dog presently occurs in principal concentrations in only three areas (Figure 2): the Awapa Plateau; the Paunsaugunt region along the East Fork and main stem of the Sevier River; and the West Desert region of eastern Iron County with a few colonies existing in isolated mountain and desert valleys in western Iron and Beaver counties (Pizzimenti and Collier 1975, Seal 1987). The Utah prairie dog was listed as an endangered species on June 4, 1973 (38 F.R. 14678), pursuant to the Endangered Species Conservation Act of 1969.

In 1975, the Utah Division of Wildlife Resources (Division) initiated biannual census counts. Censuses of adult prairie dogs have been conducted in both the spring and fall through 1977. Since 1978, censuses have been conducted only in the spring, due to the ease of counting adult animals that have survived the winter (Table 1). Since 1976, the population has shown an upward trend in annual spring counts (Figure 3). Data from the 1989 count shows a census count of approximately 7,000 animals. Work by Crocker-Bedford (1975) indicates that only 40 to 60 percent of the total prairie dog numbers are above ground at one time; thus, the 1989 census count of 7,000 animals may actually represent an estimated total species number of 14,000 adult animals. The reestablishment of Utah prairie dog populations on public lands where greater protection is provided is crucial to ensuring the continued existence of the species. Thus, in 1972, the Division initiated a transplant program to move animals from private agricultural lands to areas of historical occupancy on public lands. The emphasis at this early stage of the program was to move large numbers of prairie dogs in an attempt to help landowners with increasing prairie dog numbers (Flinders and Jacquart 1985). Over a 17-year period from 1972 to 1989, roughly 14,000 prairie dogs were transplanted to public land sites.

Despite only limited success with the transplant program before 1983, the total number of Utah prairie dogs increased from 4,306 in 1976 to 7,988 in 1983 and the number of active colonies on public land increased from 11 to 23 during the same period (Coffeen 1983). Much of the increase in total prairie dog numbers can be attributed to the phenomenal increase in prairie dog numbers on private lands in the Cedar and Parowan Valleys in the West Desert region (appendix C). These two valleys are contiguous and have similar habitat. Increases in number of active colonies on public land are probably attributable to a combination of factors including the transplanting program, natural increases at existing sites, and discovery of previously unrecorded colonies.

Figure 2. Present distribution of the Utah prairie dog



1. West Desert 2. Paunsaugunt 3. Awapa Plateau

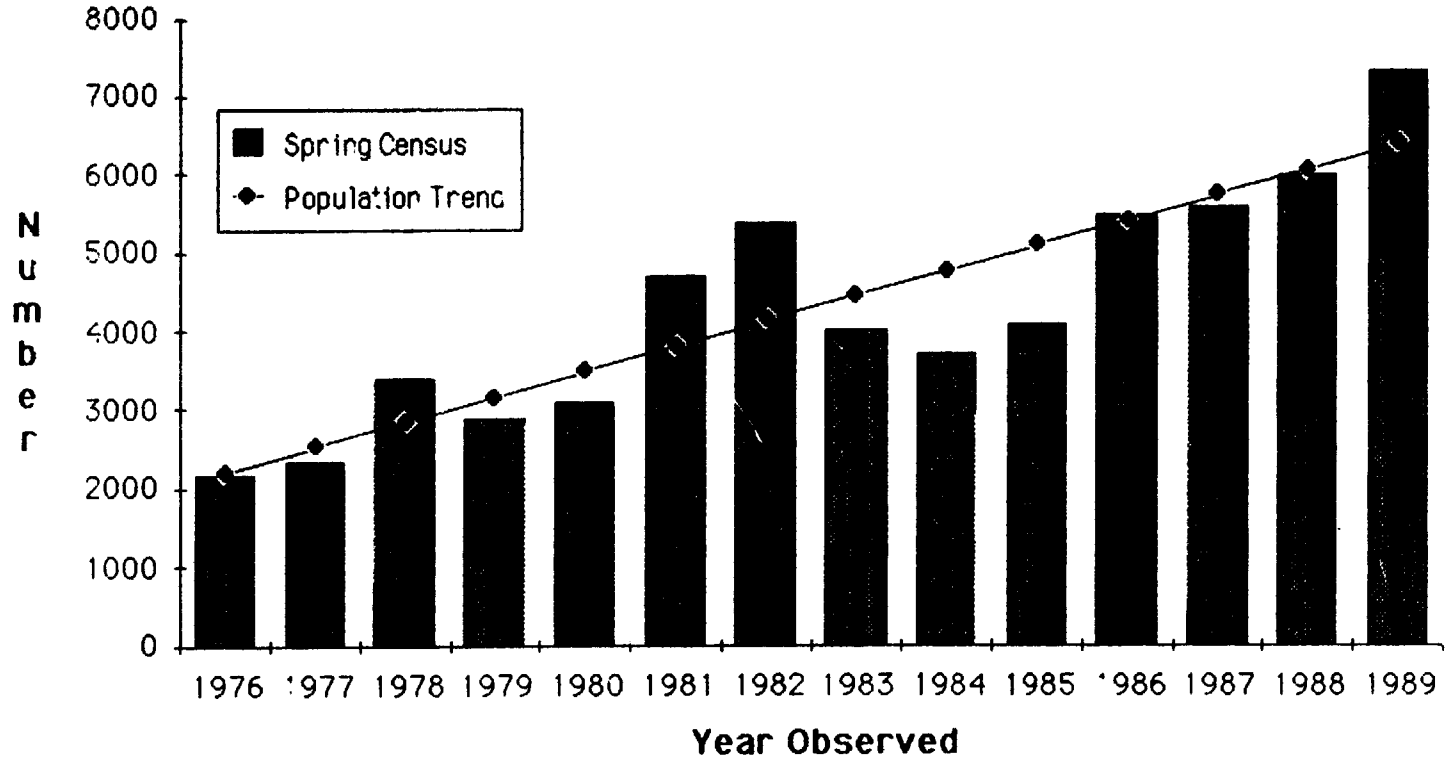
Table 1. Estimates of Utah prairie dog numbers for certain years between 1920 and 1990.

	Date	Census Count	Source	
	1920	95,000*	Collier and Spillett	1973
	1970	8,800*	"	"
	1971	5,700*	"	"
	1972	3,300*	"	"
fall	1975	2,975	Heggen and Hasenyager	1977
spring	1976	2,153	"	"
fall	1976	2,278	"	"
spring	1977	2,321	"	"
fall	1977	3,429	"	"
spring	1978	3,375	"	1978
"	1979	2,877	"	1979
"	1980	3,090	"	1980
"	1981	4,689	"	1981
"	1982	5,371	"	1982
"	1983	3,996	Coffeen	1983
"	1984	3,690	"	1984
"	1985	4,086	"	1985
"	1986	5,471	"	1986
"	1987	5,574	"	1987
"	1988	5,984	"	1988a
"	1989	7,377	"	1989
"	1990	1,098**	"	1990

* Figures for the years 1920, 1970-1972 represent the author's best estimate of the total number of prairie dogs.

** Figure for the year 1990 represents count for public land only.

Figure 3. Spring Count of Adult Utah Prairie Dogs With Population Trend 1976-1989.



Data Source: Utah Division of Wildlife Resources

Graph: R. Benton

Because of the improved status of the species and the overwhelming increases seen on private lands in the Cedar and Parowan Valleys, where prairie dog numbers climbed from a census count of 627 in 1976 to a census count of 3,699 animals in 1982 causing severe crop damage, the Division petitioned the Service to remove the Utah prairie dog from the Federal List of Endangered and Threatened Wildlife. Upon reviewing all pertinent biological data, the Service determined that the Utah prairie dog was not currently in danger of extinction and published the final rule reclassifying the species to threatened in the May 29, 1984, Federal Register (49 F.R. 22330).

Life History

Approximately two-thirds of the adult population is female due to the higher mortality rate for juvenile males because of conflicts with adult males. Female Utah prairie dogs are capable of giving birth annually to litters that average three to four young. The young are usually born in April, after a gestation period of about 30 days. By using the number of young per litter observed above ground, Wright-Smith (1978) found that litter size varied from 1 to 6 pups per litter, with a mean of 3.9. Pizzimenti and Collier (1975) found an average litter size of 4.8 pups with individual litters varying from 3 to 6 young. Ten litters of pups have been produced in captivity at the National Zoological Park in Washington, D.C. These litters averaged 3.4 pups, ranging in number from 2 to 4 pups per litter (Harold Egoscue pers. comm. 1979, National Zoological Park, Washington, D.C.).

Juvenile prairie dogs appear above ground at an age of 5 to 7 weeks. They attain adult size by October and reach sexual maturity at the age of 1 year. Two litters of pups were observed above ground at the Three Peaks transplant site in the west desert on May 21, 1978. This site is on land managed by the Bureau of Land Management. The elevation at this location is 6,000 feet (1,829 meters). Crocker-Bedford (1976) saw the first young emerge on May 15 in a colony at 6,726 feet (2,050 meters) and on May 22 in a colony at 7,612 feet (2,320 meters). Long (1940) collected two female Utah prairie dogs west of Cedar City on May 3 and 4, 1936, and both had active mammae. At this same prairie dog colony on June 27 of that year, he reported "many young, ranging in size."

Adult males cease surface activity during August and September and females follow suit several weeks later. Juvenile prairie dogs remain above ground 1 to 2 months longer than adults and have been observed above ground as late as December 24. Few prairie dogs are above ground from the first of November through mid-February. However, they are not totally dormant in the winter and juvenile prairie dogs have been observed above the ground in a foot of snow (M. Coffeen, Regional Nongame Manager, Utah Division of Wildlife Resources, pers. comm., 1991).

Badgers, coyotes, raptors, and possibly weasels are the primary predators on Utah prairie dogs. In established colonies, predators probably do not exert a controlling influence on numbers of prairie dogs (Collier and Spillett 1972). Predation is more of a problem in new colonies (Jacquart et al. 1986). Bryce Canyon National Park personnel reported badger predation to be a prime factor

for rapid dispersal of transplanted prairie dogs. New and underdeveloped burrow systems may afford little protection from burrowing predators (Turner 1979). Because most badgers dig in less developed peripheral burrows, badger predation also can reduce colony expansion (Crocker-Bedford 1975). Coyote predation is most severe in areas where prairie dog colonies are expanding.

Habitat and Food Requirements

There is a positive correlation between available moisture and prairie dog abundance and density or (because prairie dogs get most of their water from plants), a direct correlation between the amount of moisture available in vegetation and prairie dog densities. Prairie dogs appear to prefer swale type formations where moist herbage is available even during drought periods. In colonies at low elevations where moist herbage is available, breeding occurs in the early spring and lactation continues into June. Adult females require almost twice as much energy per day during the lactation period (Crocker-Bedford 1975).

Soil characteristics are an important factor in the location of Utah prairie dog colonies. A well-drained area is necessary for home burrows. The soil should be deep enough to allow burrowing to depths sufficient to provide protection from predators and insulation from environmental and temperature extremes. In southern Utah soils, caliche layers are an important limiting factor in the location of prairie dog colonies. Prairie dogs must be able to inhabit a burrow system 3.3 feet (1 meter) underground without becoming wet. Soil color may aid in disguising prairie dogs from surface predators (Collier 1975; Turner 1979) and thus may be an added survival factor.

The vegetative height within the colony must be low enough to allow standing prairie dogs to scan their environment for predators. For this reason, controlled grazing is compatible with prairie dog colonies (Crocker-Bedford 1975). Prairie dogs are predominantly herbivores. Grasses are preferred food items during all seasons. The flowers and seeds of forbs such as alfalfa also are preferred. Although forbs other than alfalfa are not always highly preferred items, they may be critical to a prairie dog colony's survival during drought. Prairie dogs also have been observed eating the flowering parts of shrubs, especially during the fall. Dead vegetation and even cattle feces also are utilized by prairie dogs and are preferred over leaves and stems of shrubs by young prairie dogs. Prairie dogs discriminate between particular plant parts when feeding. Flowers and seeds are selected and preferred when they are available. Young leaves are selected over old leaves and stems rarely are eaten (Crocker-Bedford and Spillett 1981). Utah prairie dogs eat almost all the green vegetation they cut. Thus, through selecting flowers, seeds, and young leaves, prairie dogs obtain higher proportions of proteins and digestible energy than would have been provided by older leaves and stems. Prairie dogs also collect dead vegetation for nest material. Cicada insects (Cicadidae) are a preferred animal food item and are readily taken when available (Crocker-Bedford and Spillett 1981).

Prairie dogs gain the most weight and colony expansion is greatest when alfalfa or other cool season, palatable forage is available. This situation most often occurs in low elevation colonies in agricultural areas (Crocker-Bedford 1975).

The daily food needs of a prairie dog colony are greatest during late spring when the greatest number of prairie dogs are feeding. Since prairie dogs feed very little from November through the middle of February, the prairie dog colony's food needs are lowest at this time.

Reasons for Decline

There are several reasons for the drastic decline in prairie dog numbers. Poisoning campaigns conducted in Utah to eliminate prairie dog damage to agricultural and ranching operations were a significant factor. Prairie dog reductions corresponded with periods of intensive poisoning occurring around 1933, 1950, and 1960. Species recovery followed each campaign, but some colonies were completely eliminated (Collier and Spillett 1973).

Habitat loss and poor quality of much of the existing habitat is of immediate concern for the remaining Utah prairie dogs. Much of the remaining occupied habitat is located on private lands and a great percentage of this land has been or will be developed for farms or housing projects. In 1977, 73 percent of all Utah prairie dog colonies and 81 percent of the prairie dogs were located on private lands (Heggen and Hasenyager 1977). Prairie dogs located on private lands, especially in large overcrowded colonies can cause severe crop and equipment damage. Such conflicts often result in the eradication of the colony through poisoning. As previously mentioned, poisoning is suspected in the loss of several prairie dog colonies in 1983. This was never confirmed, however. The 20 animals picked up at the sites were tested for only one toxicant with negative results.

Long-term overgrazing has caused a great reduction in the quality of prairie dog habitat. Such long-term overgrazing resulted in a brush invasion causing a vegetation shift from grass to shrub forage, reducing habitat quality for prairie dogs. Historically, prairie dog colonies were located in swale formations. Overgrazing led to erosion of the swales, thus transforming them into gullies. This, in turn, lowered the water table to channel bed level thereby reducing the amount of moisture available for the palatable grasses and forbs that supply summer food for the prairie dogs (Crocker-Bedford 1975). The control of range fires in modern times also has contributed to the shift from grass to shrubs (Stoddart et al. 1975). Climatological changes also have resulted in a constriction of the species distribution. The western portion of the species' historical range has become less favorable to prairie dogs due to the higher temperatures, drier climate, and gradual replacement of tall grasses with salt-shrub vegetation. Drought has been a significant short-term factor and has caused the elimination of several colonies (Collier and Spillett 1975).

Physiographic barriers such as mountains or deserts on the eastern, western, and southern margins have restricted expansion of the Utah prairie dog's range. These barriers are uninhabitable and uncrossable by prairie dogs. According to Collier and Spillett (1975), in the north and central part of the State the prairie dog faced competition with the Uinta ground squirrel also which served as a biological barrier to expansion of the prairie dog range.

Diseases such as plague have been reported in prairie dog colonies. While there is little evidence that disease was a major factor in the past decline of Utah prairie dog populations (Collier and Spillett 1972), plague may have played a significant role in the recent (1990) eradication of several colonies in the Cedar-Parowan Valley area (M. Coffeen, Regional Nongame Manager, Utah Division of Wildlife Resources, pers. comm., 1991). Overall prairie dog estimates in this area increased from 1,254 animals in 1977 to over 7,378 animals in 1982 (Heggen and Hasenyager 1982). Such high densities in turn result in increased stress on individual animals. Rodent populations are subject to plague outbreaks where such conditions as over-population/increased stress exist.

Transplant Program

The Division initiated a transplant program for Utah prairie dogs in 1972. The purpose of the transplant program was to move a maximum number of animals from private agricultural lands to reduce prairie dogs foraging on croplands (primarily alfalfa) and to increase numbers of prairie dogs in areas of historically occupied areas on public lands. Specific guidelines also were developed for selection of transplant sites (appendix B). Over the 17-year period from 1972 to 1989, about 14,000 prairie dogs were transplanted (Coffeen 1989). All prairie dogs were released in optimal habitats on public lands. Holes were augered to provide temporary below ground protection at release sites. In some cases, fences were constructed to prevent the animals from immediately dispersing. However, despite these efforts, only limited success was achieved during the early years of the program.

Two radio-tagged male prairie dogs released in mid-August 1978 at a new site, entered separate burrows and backfilled them. Presumably, they commenced aestivation, as they were not observed emerging from the holes. However, the study and observation of the prairie dogs terminated shortly thereafter when their radios failed, making it impossible to locate them.

The project evaluation study revealed that the following factors should be considered (in addition to those discussed in the Habitat and Food Requirements section) before prairie dog transplants are made: moving only prairie dogs from a single prairie dog colony to a new location to retain familial relationships is most successful; prairie dogs should not be relocated within an already viable prairie dog colony for the purpose of establishing new colonies; the distance between transplant sites and established prairie dogs should be great enough to prevent interactions; and predators should be removed from transplant sites before and during the time that prairie dogs are being relocated and are establishing themselves (Turner 1979).

A summary of transplant data from 1972 to 1989 is presented in appendix D. While this data indicates an overall increase in the number of transplant colonies, it also clearly reflects the need for additional research into transplant procedures in order to increase the rate of transplant success. In 1983, the Division decided to shift the emphasis of the prairie dog program from moving large numbers of prairie dogs to investigating ways of improving transplant success. As a result, the Division initiated a graduate project

study in 1984 to carefully monitor survival, dispersal, and habitat use of transplanted prairie dogs in order to determine their requirements and the best techniques, time, and location, etc., for transplants.

As part of the above-mentioned study, two groups of Utah prairie dogs were radio instrumented by surgically implanting transmitters into the peritoneal cavity. The first group of prairie dogs were transplanted in June, while the other group of animals were released in August. Historical burrow mounds were cleared of vegetation and two additional holes were augered in each historical mound. Wire baskets also were placed over the holes to temporarily restrain the prairie dogs (Flinders and Jacquart 1985).

Preliminary results of this study showed that upon escaping from the baskets, newly transplanted prairie dogs dispersed in a random fashion utilizing the artificial burrows (augered holes) or digging only shallow, temporary burrows for protection. Only after a period of 2 to 3 weeks were permanent burrows established by two adult males in the group. The group of prairie dogs released in June showed a low survival rate of juveniles and adult females. This high mortality rate appeared directly related to the severe weather experienced immediately after the transplant (Flinders and Jacquart 1985). Many of the females were lactating at the time of release and were devoid of any fat reserves. Without the protection offered by an established burrow system, they apparently could not survive. Adult males, on the other hand, had a very high survival rate. All had ample body fat to carry them through until they were able to establish new burrows.

Transplants conducted in August had a much better success rate. Females were no longer lactating and had gained the weight needed to withstand the stress of relocation. Juveniles also were larger and able to establish burrows on their own.

Predation also has proven to be a problem on new transplant sites. Badgers have historically been a major predator on relocated Utah prairie dogs (Flinders and Jacquart 1985, Collier and Spillett 1972). Shallow burrows offer little protection from such a predator, and prairie dogs are very vulnerable until a deep burrow system is established.

The results of this study have provided valuable insight into how transplant success can be improved, and techniques will continue to be refined as new information becomes available. Based on the result of this study, early season transplants will be conducted using only adult males. Adult females and juveniles will be transplanted later in the summer when they are in a better condition to survive the stress of relocation and after the adult males have established burrows.

The above study, combined with two large enclosures built by the Fishlake National Forest, have resulted in well-established colonies. Brush removal with a brush cutter pulled behind a tractor to improve habitat also has resulted in prairie dog mounds being established outside of the enclosures.

Control Program

The population trend for the Utah prairie dog has been up since 1976 (Figure 3). The 1988 spring count of 5,984 is nearly three times greater than the 1976 low of 2,160 (Coffeen 1988a). The 1989 spring count was 7,377 animals (Coffeen 1989). The 1990 count of 969 prairie dogs is not representative of the previous years since only public land colonies were counted (Coffeen 1991).

It is important to note that the spring census does not tally the entire adult population; it counts only observed adult animals that have successfully survived the winter. Recent spring counts have been conducted using a dog to "tease" prairie dogs into standing up and giving an alarm call (Coffeen and Jordan in prep.). Based on a quick field comparison between census results using the current "canine tease" method and optical methods used previously, it is believed that between 70 to 90 percent of the actual adult population is counted in the spring census using the canine tease (Coffeen 1986, 1987, 1988b, pers. comm., 1991; Coffeen and Pederson 1989). Assuming 80 percent of the population was counted in the 1989 spring census (7,377), then the actual adult 1989 spring population would have been over 9,200 animals.

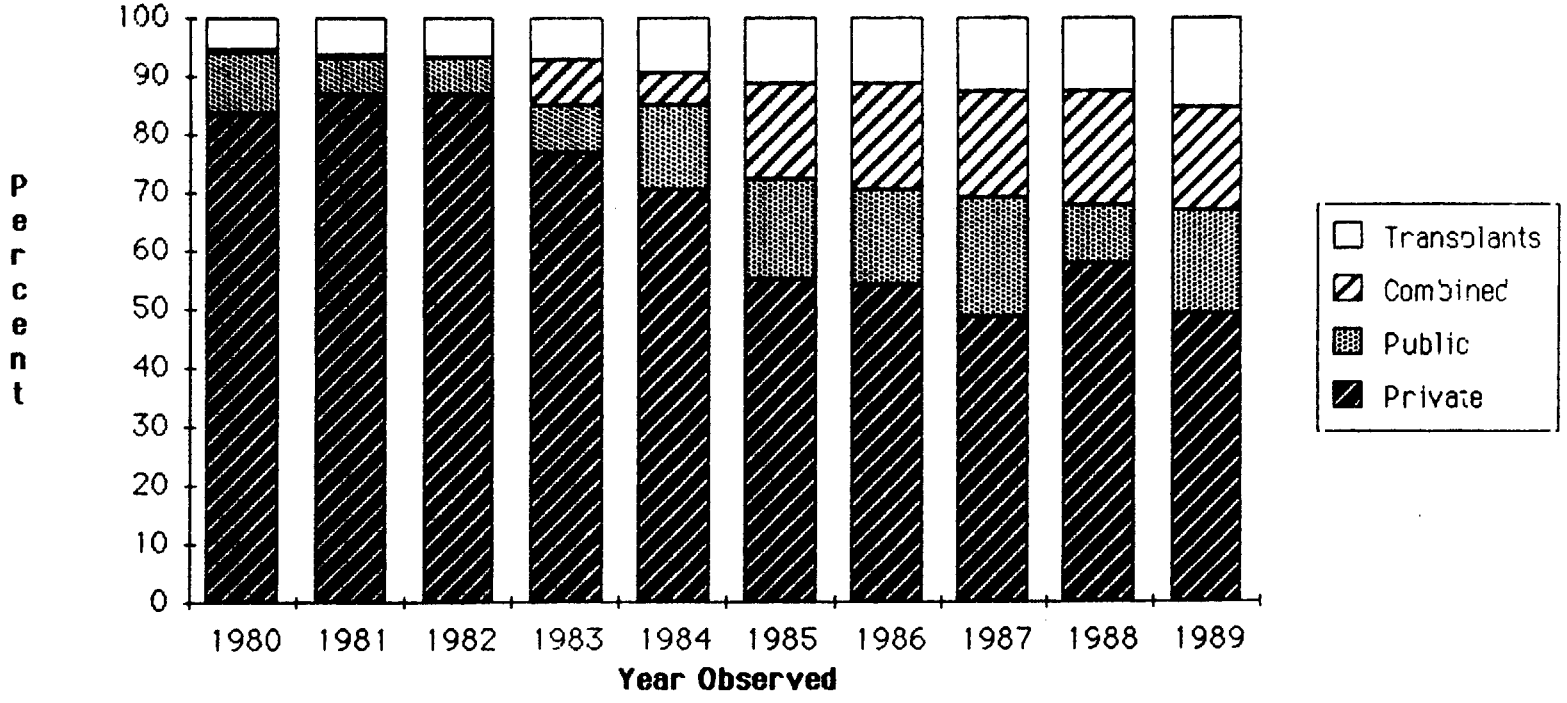
In the summer, there is a population explosion of Utah prairie dogs above ground as the young-of-the-year emerge from burrows and disperse, creating serious conflict between the Utah prairie dog and human agricultural interests. The major crop on private land is alfalfa, which is a preferred food of the prairie dog. Crop losses are extensive where large prairie dog colonies and complexes have developed. Prairie dog mounds also damage haying equipment and the burrows drain irrigated fields. It was estimated that the large summer populations of these prairie dogs cost local ranchers $1.5 million annually in crop losses and damage to equipment (Ivan Matheson, former Utah State Senator, pers. comm., 1984).

The nuisance prairie dog problem results from the species' high rate of reproduction. Female Utah prairie dogs give birth to an average of 4.8 young in April (Pizzimenti and Collier 1975). Assuming that two-thirds of the adult population is female, and conservatively assuming that each female produces an average litter of 4 young, then the total population would be expected to triple to 33,700 animals in the summer of 1989 throughout its range (J. Pederson, Mammals Program Coordinator, Utah Division of Wildlife Resources, pers. comm., 1991).

The Division believes that ranchers in the area will not continue to tolerate such crop losses (M. Coffeen, Regional Nongame Manager, Utah Division of Wildlife Resources, pers. comm., 1988). As prairie dog populations continue to expand into previously unoccupied areas, which include agricultural fields, many fields have become so densely populated that they are completely ruined for agricultural use and have been abandoned by farmers.

In an effort to mitigate the overpopulation problems on private land and to establish new colonies on public land, the Division has implemented a transplant program, which has transplanted over 14,000 prairie dogs to public lands since 1972. About 49 percent of all Utah prairie dog colonies occurred on private land in 1987 (Figure 4), down from a high of 87 percent in 1981 (Coffeen 1988b). While the transplant program developed by the Division has

Figure 4. Percent of Utah Prairie Dogs by Land Ownership.



Data Source: Utah Division of Wildlife Resources

Graph: R. Benton

proven to be successful, particularly after transplantation techniques were refined in 1985, this labor-intensive program has never been able to keep pace with the growing prairie dog populations on private land.

Because the transplant program could not handle all nuisance animal complaints, a controlled "take" program was needed to address the problem of nuisance juvenile animals. Adult prairie dogs cease surface activity in late August and September, but young animals continue surface activity and feeding until as late as December at lower elevations. These juveniles, which are the source of the nuisance animal problem, experience high natural mortality over the fall and winter. This high natural overwinter mortality is typical for small rodents with high reproductive rates.

Given the huge increase in prairie dog numbers in the summer and the high natural mortality of animals in the fall and winter, it appeared that allowing controlled "take" of nuisance animals between June 1 and December 31 would address farmers' needs to control nuisance animals without interfering with conservation efforts. In essence, farmers would be allowed to "take" animals that would probably have perished anyway. Also, there could be positive benefits, on a population level, to the Utah prairie dog from a controlled "take" program. In a few areas, the large number of juvenile animals added annually each summer strains the carrying capacity of available habitat in a few areas. Cultivated fields provide artificially high levels of food, promoting unnaturally high population levels and densities. Higher densities increase prairie dog to prairie dog contact, which increases the probability of disease transmission. With high population densities, and as colonies spread and tend to become continuous, there is a greater danger from the outbreak of disease such as sylvatic plague. Such populations can be completely eliminated by epizootics (Collier and Spillett 1972). By keeping population booms to more moderate levels, the control program could stabilize prairie dog populations on private land, enabling a slow steady growth in numbers instead of the boom and bust cycles associated with outbreaks of disease.

So, as part of the reclassification from endangered to threatened in 1984, the problem of nuisance animals was addressed by developing a special rule for the Utah prairie dog (50 CFR 17.40 (g)) to allow the "take" of Utah prairie dogs in Cedar and Parowan Valleys, Iron County, Utah, under a permit system developed by the Division. These valleys were the only ones in which nuisance animal problems were reported at the time. The number of Utah prairie dogs which could be "taken" was limited to 5,000 animals annually, and "take" was confined to the period between June 1 to December 31. The field activities of the control program are, by request of the Service, exclusively administered by personnel of the Division under a special rule. Under the control program, an applicant for a permit is required to sign an application form stating that he/she understands the provisions of the Utah Prairie Dog Proclamation. Division personnel then conduct a visual census of the applicant's problem area and issue a control permit only for the number of Utah prairie dogs actually causing damage. Permits allow controlled shooting and trapping. "Taking" cannot include the use of chemical toxicants, because no such materials are registered for control of the species. At the end of the 30-day permit period, the permittee is required to return a report form indicating the number of animals "taken," the method of "take," and the method of disposal (Jacquart and Coffeen 1987).

The State was required to report "take" to the Service's Regional Office in Denver, Colorado, every 90 days, specifically: name and address of each person holding an active permit; reason for issuance of each permit; number, location, and method of "take" for all Utah prairie dogs "taken" during the reporting period; and any other information requested by the Service. If the Service were to receive substantial information that these "takings" were having an effect inconsistent with the conservation of the Utah prairie dog in the area of "take" the Service may immediately prohibit or restrict such "taking" as appropriate, for the conservation of the population. Such prohibitions or restrictions have not proved to be necessary, as explained below.

An analysis of the spring census population data for the two valleys in the control program reveals a general growth trend for the period 1985 to 1989. In the first year of the control program (1985), the spring count was 2,113 animals. Later that year, 426 prairie dogs were "taken" legally. The following year (1986), the spring count was 3,012 animals, or an increase of 43 percent (Coffeen 1986). Later in 1986, 1,247 animals were reported "taken" by permit holders. The next year's (1987) spring count was 2,220 animals, or a decrease of 26 percent (Coffeen 1988b). In 1987, only 370 animals were "taken." The spring count increased 65 percent to 3,660 animals in 1988 (M. Coffeen, Regional Nongame Manager, Utah Division of Wildlife Resources, pers. comm., 1989). In 1988, 528 animals were "taken," and the next year's spring count showed an increase of 8 percent to 3,969 animals in 1989. In 1989, 838 animals were "taken," and in 1990, 1,267 animals were reported "taken" on private lands in the area of regulated "take."

The control program must be considered a success. It has provided private landowners a means to alleviate localized problems with the Utah prairie dog on their land in a manner that does not undermine conservation efforts. In fact, prairie dog spring counts increased 88 percent in the control area over the period 1985 to 1989. The control program also has improved cooperation between farmers and conservation agencies and reduced the incentive for landowners to kill prairie dogs illegally. The incidence of illegal "take" of Utah prairie dogs has dropped significantly in the control area, based on State law enforcement records (M. Coffeen, Regional Nongame Manager, Utah Division of Wildlife Resources, pers. comm., 1989).

The general increase in prairie dog numbers has resulted in an expansion of colonies into formerly uninhabited areas. Adult spring Utah prairie dog counts in the Panguitch area, Garfield County, Utah, went from 444 in 1984 to 905 in 1989, an increase of 104 percent in 4 years (Coffeen 1989). The story was the same for the Loa area, Wayne County, Utah. The spring count in that area increased by 77 percent from 60 in 1984 to 106 in 1989. Private landowners outside of the Cedar and Parowan Valleys are now requesting permits to "take" Utah prairie dogs on their private land.

The Service published a final rule on June 14, 1991, (56 F.R. 27440) to amend the existing special rule to include all private land throughout the range of the Utah prairie dog. Additionally, the total yearly "take" was increased from 5,000 to 6,000 animals. The final rule also eliminated the quarterly reporting requirement. All other provisions of the special rule remained unchanged. The

amendment is considered necessary and advisable for the conservation of the Utah prairie dog. By allowing additional private landowners to remove biologically expendable nuisance animals under controlled conditions, the rule change controls these animals without impeding species recovery, significantly lowers landowner opposition to species recovery, and reduces the vulnerability of the species to outbreaks of plague due to overcrowding. This rule also is expected to improve future cooperation between wildlife management agencies and private landowners in managing for the Utah prairie dog, reduce the incidence of illegal killing, and stabilize populations of prairie dogs on private land so carrying capacity is not exceeded.

PART II

RECOVERY

Objective

The primary objective of this recovery plan is to delist the species by establishing and maintaining the species as a self-sustaining, viable unit with retention of 90 percent of its genetic diversity for 200 years.

This goal can be accomplished by establishing and maintaining for 5 consecutive years three populations with a minimum number of 813 adult animals each, counted on public land in the annual spring census conducted by the Division (Seal 1987). This minimum viable number is based on a long-term maintenance program to maintain genetic diversity by transferring animals between each of the genetically separate populations. To maintain the species without a long-term transfer of animals would require a larger minimum viable population estimate in each population. A formal Memorandum of Understanding between the Service and the appropriate Federal land management Agencies (Bureau of Land Management, National Park Service, and Forest Service) is needed for long-term management to ensure the continued protection of the Utah prairie dog following its removal from the Endangered Species List. The delisting of the Utah prairie dog can be considered when these criteria are met.

The genetic goal is that the species be present in sufficient numbers to allow selection and adaptation to changing environments to occur over time. This would mean that any loss of genetic diversity of the Utah prairie dog would be the result of natural selection rather than genetic drift or loss because of insufficient population numbers. The genetic goal also implies that replacement or accumulation of genetic diversity would occur through time by the processes of mutation, drift, and selection. Chesser (1984) found that the Utah prairie dog lacks genetic variability. He noted that while the social organization of prairie dogs helps to preserve genetic variation, it also has the effect, in very small populations, to allow genetic drift to occur rapidly and this may have happened with this species (see Description section).

The demographic goals would be met when populations of the species are distributed throughout the prairie dog's range so that the species is protected against extinction from catastrophe whether from natural or man-caused actions. Populations that do go extinct will have to be reestablished by transplants from the other populations. Based on Chesser's (1984) study, genetic markers will not be useful in developing management strategies or recovery goals for the Utah prairie dog. Although no genetic variation was evident from the genetic loci examined in his study, it does not necessarily follow that absolutely no variation exists within the population or that effects of inbreeding will not occur (Chesser 1984). Thus, any forced inbreeding should be avoided in the restoration program with transplants consisting of animals from different areas.

All colonies should be in the Utah prairie dog's historical range but in a geographically dispersed pattern in a variety of suitable habitat types. Past transplant efforts have placed emphasis on establishing Utah prairie dogs in the area west of Cedar City and in isolated mountain valleys, like Buckskin Valley northeast of Paragonah, Bryce Canyon National Park, and the Fishlake basin which are all far removed from private lands. By spreading the colonies far apart, the chances of localized catastrophies (such as predation, disease, and human destruction) destroying a major portion of the species populations are greatly reduced. By propagating colonies in a variety of different habitats, the possibility of environmental extremes (such as severe winter, flooding, droughts, and hot summers) destroying large portions of the population also are reduced.

The following populations have been identified (Seal 1987) in the range of the Utah prairie dog with their current census (1990), potential capacity, and primary ownership (Coffeen 1991):

Population	Census	Potential Capacity	Ownership
West Desert	375	2,400	Public
Paunsaugunt Area	254	1,500	Public
Awapa Plateau	292	2,000	Public

As presently delineated, only three populations on public land (West Desert, Paunsaugunt Area, Awapa Plateau) have the capacity to sustain prairie dog numbers that would exceed the current minimum viable number of 813 animals. Cedar Valley, while having the capacity to hold far more than the minimum viable number, cannot be counted because it is predominately private land. Private land colonies will contribute to the survival of this species but cannot be counted for long-term survival as multigenerational populations due to the inability to ensure their continued protection from human disturbance. Further refinements of these areas may cause the numbers to change.

Delisting Criteria

The delisting of the Utah prairie dog can be considered when the following criteria are met:

1. Three populations on public lands are established and maintained, one population in each of the following areas: a) West Desert, b) Paunsaugunt Area, and c) Awapa Plateau.

2. A minimum population of 813 animals, counted on public land in the spring, is maintained in each population for 5 consecutive years.

3. A formal Memorandum of Understanding has been signed among the Service and the Bureau of Land Management, the National Park Service, the Forest Service, and the Utah Division of Wildlife Resources for long-term management of each population following delisting, including the transfer of animals for genetic purposes.

Stepdown Outline

1. Determine historical range and species distribution.

2. Continually update information on present populations and distributions.

   21. Continue distribution studies of present populations.

      211. Examine aerial photos for active Utah prairie dog colonies.

      212. Conduct aerial searches of historical range for prairie dog colonies.

      213. Conduct ground searches of areas of suspected occurrence.

   22. Conduct annual census of spring breeding populations to determine minimum breeding population.

   23. Validate current census techniques for prairie dogs.

3. Determine what factors influence the viability of Utah prairie dog colonies.

   31. Survey active colonies.

      311. Conduct vegetation sampling.

      312. Document elevation.

      313. Document annual/monthly precipitation.

      314. Document temperature extremes/average.

      315. Document slope and aspect.

      316. Determine soil characteristics.

      317. Study occurrence/effects of predation.

      318. Review management practices.

      319. Document proximity to private land.

      320. Record life history data.

   32. Survey successful transplant sites (as outlined in tasks 311 to 320).

   33. Survey unsuccessful transplant sites (as outlined in tasks 311 to 320).

4. Select management and transplant sites.

   41. Protect habitat or secure management authority on private land prairie dog colonies.

   42. Select sites for future transplants on public lands within historical range.

5. Conduct transplant program.

   51. Determine trapping methodology.

   52. Capture and transport Utah prairie dogs from private and public lands.

   53. Prepare sites and prairie dogs for release.

      531. Prepare Utah prairie dogs for release.

      532. Prepare transplant sites.

   54. Release Utah prairie dogs.

   55. Revise transplant techniques as needed.

6. Monitor transplanted colonies.

   61. Conduct observational monitoring.

   62. Radio monitor selected transplanted animals.

7. Ensure protection of prairie dogs and their habitat on both existing and transplant sites on public and private lands.

   71. Enforce laws.

   72. Monitor land use policy changes and conduct Section 7 consultation.

8. Manage prairie dog colonies by developing and implementing site-specific management plans for each colony or transplant site.

   81. Modify and manage habitat as necessary.

      811. Modify active colonies and successful transplant sites.

      812. Modify proposed transplant sites.

   82. Manage limiting factors.

      821. Control predators as necessary.

      822. Ensure that habitat management plans which are implemented by land management agencies contain directives that will benefit the Utah prairie dog.

83. Control prairie dog colonies.

831. Limit distribution.

832. Limit colony density.

9. Conduct an information and education program.

Narrative Outline

1. Determine historical range and species distribution.

   Much of this work has been completed; however, additional data would benefit the project. One goal of the project is to reestablish the Utah prairie dog in areas of historical occupancy; therefore, historical prairie dog colony areas must be located. It probably is not possible to obtain accurate figures of past populations, but knowledge of where the larger concentrations existed will be useful. Many individuals who worked, recreated, and lived in southwestern Utah have unrecorded information on prairie dog populations. An effort will be made to document this information. Although most published and unpublished literature has been searched, a renewed emphasis should be placed on reviewing government records of past control work. All such information will need to be verified in the field. Usually, evidence of past colonies can be determined from earth mounds of subsurface soil in areas where prairie dogs once occurred.

2. Continually update information on present populations and distributions.

   The current status of Utah prairie dog populations and distributions must be regularly determined so the progress of recovery processes can be assessed.

   21. Continue distribution studies of present populations.

       The Division has maps of all known Utah prairie dog colonies. The maps need to be reanalyzed to make sure no colonies have been overlooked and to reevaluate old colonies. This effort will utilize information gained in Task 1.

       211. Examine aerial photos for active Utah prairie dog colonies.

            Recent aerial photographs are available for most of the historical range of the Utah prairie dog. These photographs will be checked for evidence of prairie dog colonies.

       212. Conduct aerial searches of historical range for prairie dog colonies.

            Fixed-wing aircraft and helicopters are efficient ways to locate colonies and determine if they are active. This method will be used when surveying large areas.

       213. Conduct ground searches of areas of suspected occurrence.

            All areas of possible colonies will be ground-truthed to determine if Utah prairie dogs do occur on the sites.

22. Conduct annual census of spring breeding populations to determine minimum breeding population.

The Division has conducted a spring census of all known Utah prairie dog colonies since 1976; and in cooperation with other Agencies (Bureau of Land Management, National Park Service and Forest Service), should continue to do so. These surveys provide indications of the species trend.

23. Validate current census techniques for prairie dogs.

No accurate method of censusing subterranean mammals has been developed. Work by Crocker-Bedford (1975) indicates that a census of above-ground prairie dogs during periods of peak activity probably included only 40 to 60 percent of the total prairie dogs.

3. Determine what factors influence the viability of Utah prairie dog colonies.

To be able to select sites for reestablishment of colonies and to improve the existing colonies, data collections and evaluation of many types of sites should be conducted on the Utah prairie dog, but special emphasis should be placed on the collection of vegetative data. This will ensure that the correct factors are used for habitat alteration and transplant site selection.

31. Survey active colonies.

Because the reestablishment of new colonies will be made on public range lands, the collection of data from this habitat type is essential. Active colonies on public lands should be surveyed for various habitat parameters. Active colonies on private land are usually on good habitat due to better soil types and water availability. Many have expanding populations and may be able to supply information on optimum habitat characteristics as well as some direction for habitat manipulation. Information obtained from these existing sites will then be used to set criteria for transplant site selections.

311. Conduct vegetation sampling.

Monitoring of annual forage production and composition should be conducted. The vegetation on the colony site serves as the prairie dog's source of food, cover, and nest material. Species necessary to meet these needs will be determined. Several studies conducted on the food habits of white-tail prairie dogs (Cynomys gunnisoni) provide general guidance on the needs of the Utah prairie dog. Studies by Collier (1975) examine broad habitat parameters for the Utah prairie dog in all three major concentration areas. Work by Crocker-Bedford (1975) provides data on specific diet requirements but studies were restricted

to only one area. Hasenyager (1983) provides detailed vegetative data for spring, summer, and fall on all three concentration areas. Vegetation sampling will include documentation of vegetation types, visibility requirements, and food value.

312. Document elevation.

Utah prairie dogs are found at elevations ranging from 5,249 to 9,301 feet (1,600 to 2,835 meters). Those animals near the elevational extremes probably fall victim to the extremes of the climate. Further data collection and analysis is needed to determine the best elevations for Utah prairie dogs.

313. Document annual/monthly precipitation.

Precipitation determines the vegetative quantity and quality on the site. Such data can provide information on what precipitation levels are needed to sustain viable prairie dog numbers. Extreme yearly fluctuations from annual averages indicate a site may undergo severe precipitation fluctuations from year to year. Such fluctuations, especially minimum extremes, would indicate a site may be unsuitable. Observation of existing sites should provide data on the ability of prairie dogs to survive extreme precipitation fluctuations and what range of fluctuation they could tolerate. The long-term monthly average will indicate seasonal distribution of the precipitation. Seasonal distribution of precipitation determines the probable composition of range plants and their manageability.

314. Document temperature extremes/average.

Both the periodic temperature extremes and average temperatures at each site are important to prairie dog survival. Correlation between these factors and prairie dog census estimates can be used to determine optimum temperature regimes.

The 10-year monthly average will help to determine what temperatures are desirable/necessary over extended periods to maintain optimum prairie dog populations. The 10-year monthly extremes, because of their duration and frequency, influence the viability of a site.

315. Document slope and aspect.

The slope and aspect of a site have an effect on water runoff, snowmelt, water storage, ground temperature, and other factors important to site viability as well as vegetative composition.

316. Determine soil characteristics.

Soil type, color, and depth are important to colony site suitability. By observing the soil type, coloration, and depth at existing prairie dog colonies and correlating this with census levels, the optimum soil characteristics can be determined. Soil type affects burrow construction and the vegetation growing in an area and thus determines a site's suitability for prairie dogs. Soil color appears to be important in providing cryptic camouflage. The soil must be deep enough to allow the prairie dogs to construct burrows deep enough for winter survival.

317. Study occurrence/effects of predation.

Predators in the vicinity and their effect on the colonies should be determined.

318. Review management practices.

The past and present management practices on a site should give data relevant to future management that would be beneficial to Utah prairie dogs.

319. Document proximity to private land.

Determine how far from the nearest private land a colony must be to prevent unwanted colonization on this land. This information will help avoid transplant sites that would potentially cause problems. Prairie dogs accidentally colonizing private land resulting from a transplant or a migration from colonies on public lands will be removed unless agreements with the landowner are made. Dispersal of transplanted prairie dogs has been studied as part of a radio telemetry study (See task 62).

320. Record life history data.

All new observations on life history should be recorded.

32. Survey successful transplant sites (as outlined in tasks 311 to 320).

Evaluate successful transplant sites for information to use in future work.

33. Survey unsuccessful transplant sites (as outlined in tasks 311 to 320).

Evaluate unsuccessful transplants to search for things to avoid.

4. Select management and transplant sites.

Cooperation of all agencies involved in this effort throughout all phases of the project is imperative. Selection of sites which best suit the criteria (optimum habitat parameters) established under task 3 and described in Appendix B, is especially important. The Bureau of Land Management, the Forest Service, and the National Park Service should select sites on their respective properties and the Utah Division of Wildlife Resources should coordinate with State agencies in selection of sites on State lands.

41. Protect habitat or secure management authority on private land prairie dog colonies.

The prairie dog colonies on private land comprise a large percentage of the total Utah prairie dog numbers and distribution. Acquisition of land may be needed on State or private lands or to secure larger tracts of prairie dog habitat or to fill in blocks of land within or adjacent to other Federal lands with protected prairie dog habitat. Leases, rental, easements, and other ways of securing selected colonies also will be investigated.

42. Select sites for future transplants on public lands within historical range.

Enough new transplant sites must be selected on public lands to fulfill the numbers outlined in the primary goal. Sites should be selected according to established guidelines (Appendix B). Each transplant site will be reviewed by the appropriate Federal Agency for compliance with the National Environmental Policy Act.

5. Conduct transplant program.

Transplanting is necessary to establish the colonies needed to achieve the primary goal.

51. Determine trapping methodology.

A study completed by Jacquart et al. (1986) found male Utah prairie dogs were the most durable for initial transplants and should be trapped in the spring between breeding and parturition. After the young are weaned and active above ground, trapping of females and young can continue until late summer. Trapping could be done in other seasons if data indicate it is necessary. Trapping individual animals in live traps is currently the best known method of capture. Capture methods will be revised as more information becomes available.

52. Capture and transport Utah prairie dogs from private and public lands.

Most prairie dogs used in transplanting will be removed from private land. This reduces damage to private land and provides the Division with a source of prairie dogs. Prairie dogs also will be removed from

sites on public lands to control the colony size and provide animals that can survive on rangelands. It is speculated that these animals would adapt better to rangeland sites than prairie dogs from private lands which are usually captured in or near alfalfa fields. Currently, all animals are held and moved to the transplant site in the trap in which they were caught. In most instances this eliminates the need to handle the animals, which reduces stress. Holding one animal or a single family unit per cage reduces both aggressive interactions and the chances of diseased animals infecting others. A few select animals will be used for monitoring and further research to refine current techniques.

53. Prepare sites and prairie dogs for release.

To increase transplant success, both the transplant sites and Utah prairie dogs must be prepared for release.

531. Prepare Utah prairie dogs for release.

The following steps will need to be followed to prepare the prairie dogs for release:

Once prairie dogs are captured, a determination will be made to see if they will be usable in a transplant program (See task 51). Because disease can be spread by parasites like fleas, all prairie dogs should be treated with a federally approved insecticide before release. Released animals will be marked with tattoos for identification, longevity, age-class, monitoring, and other studies as needed. Miniature radios will be attached to selected animals to monitor and track individuals after release (See task 62). Weight and length measurements will be collected and used for comparison with data taken after release. Weight gains and growth are very important factors to hibernating animals like the prairie dog.

532. Prepare transplant sites.

Transplant sites should be prepared for the Utah prairie dogs before releases are made. Work on the sites should be completed before the transplant date so that prairie dogs can be relocated without delay. Predators will always be in the area but they should not be removed unless they are preying on prairie dogs. Predators will be removed from the transplant site if conflict arises. Control will continue until the colony is self-sustaining. The present method of simulating new burrows should be tested further and ways to improve it researched. Simulated burrows are dug at the transplant site with a power auger to a depth of 5 feet (1.5 meters) and at a 45 degree slant. Where the habitat change is drastic, food from the capture site is provided at the transplant site until the relocated prairie dogs can adjust to a new diet.

54. Release Utah prairie dogs.

All prairie dogs will be released as soon as possible after capture, and none are held over 12 hours. A 6- by 4- by 1-foot (1.8- by 1.2- by .3-meter) open-bottomed wire cage confines the released prairie dogs at the simulated burrow. Soil, feces, and other materials from the relocated animals home burrow are placed in and around the simulated burrow at the release site. New burrows are established at historical mounds whenever possible.

55. Revise transplant techniques as needed.

Some techniques used to relocate Utah prairie dogs have been successful; however, research on ways to improve all phases of the process should continue. For example, in view of the success of the two enclosures on the Fishlake National Forest, this technique should be further evaluated or expanded upon.

6. Monitor transplanted colonies.

All transplant sites will be monitored to document the success of each attempt.

61. Conduct observational monitoring.

Sites will be observed to collect data on successes, failures, and general information of the relocated animals. They will be monitored continually for the first 48 hours after release, once a day for the next 5 days, every other day for an additional week, and once a month until the fall aestivation begins. Observations on transplanted prairie dogs indicate a 25- to 50-percent drop in numbers in 2 days and a further continued decrease until a stabilized level is reached (Jacquart et al. 1986). Observations could identify causes for this loss. A better understanding of vocalizations, foraging, burrowing, fighting, movements, and other actions on a site is needed. Further research could lead to improved transplant success.

62. Radio monitor selected transplanted animals.

Radio monitoring has been used extensively to study dispersal and decreases in numbers. In 1984, the Division initiated a radio monitoring study on transplanted Utah prairie dogs in order to determine survival, dispersal, and habitat interactions. The results of this study were published (Jacquart et al. 1986) and have been used to revise current procedures. The success rate of transplant operations has been significantly improved.

7. Ensure protection of prairie dogs and their habitat on both existing and transplant sites on public and private lands.

All sites should be protected from detrimental disturbance.

71. Enforce laws.

All laws protecting prairie dogs will be enforced to increase the chance of success. The provisions of Section 9 of the Endangered Species Act and State wildlife laws must be implemented. Law enforcement should be increased in areas of suspected poisonings and shootings.

72. Monitor land use policy changes and conduct Section 7 consultation.

All changes in State and Federal land-use policy that could affect the colonies will be evaluated and monitored. The Bureau of Land Management, the Forest Service, and the National Park Service, and any other Federal Agency must initiate Section 7 consultations with the Service as required by the Endangered Species Act for any actions they fund, permit, or authorize that may affect the Utah prairie dog. State agencies should confer with the Service for actions they may conduct, fund, or authorize that may affect the Utah prairie dog. All Federal Agencies should be aware of their responsibilities under Section 7 of the Endangered Species Act to carry out programs to conserve endangered and threatened species.

8. Manage prairie dog colonies by developing and implementing site-specific management plans for each colony or transplant site.

Individual management plans or strategies will be developed for each prairie dog colony outlining specific management directives based on the criteria established under task 3. This plan would include goals for colony size and density when or if available, as well as strategies for habitat manipulation, law enforcement and protection, and control measures.

81. Modify and manage habitat as necessary.

Active colonies, proposed transplant sites, and successful transplant sites should be managed and/or modified as necessary according to the criteria in appendix B.

811. Modify active colonies and successful transplant sites.

The criteria in appendix B will be used to improve areas of marginal habitat in active prairie dog colonies. This will improve the stability and production of the colonies.

812. Modify proposed transplant sites.

If enough suitable potential transplant areas cannot be located, areas should be modified and managed to meet the needs of Utah prairie dogs before transplants are made.

82. Manage limiting factors.

Factors that limit the growth of a colony will be managed until a colony is determined to be self-sustaining.

821. Control predators as necessary.

Predators will be managed as necessary to facilitate establishment of transplanted colonies or increase of active colonies. Once colonies become established, predators will have less impact on them and predator control will be decreased or terminated.

822. Ensure that habitat management plans which are implemented by land management agencies contain directives that will benefit the Utah prairie dog.

Habitat management plans or action plans developed by the Bureau of Land Management or Forest Service are reviewed annually. Goals and strategies outlined in site-specific management plans, as well as information on optimum habitat parameters, should be included in these management plans. Habitat improvements can then be implemented which also encourage growth and protection of prairie dog colonies.

83. Control prairie dog colonies.

Colonies may need to be controlled to reduce the chances of disease and conflicts in agricultural areas on private lands.

831. Limit distribution.

Colonies should not be allowed to grow uncontrolled causing significant conflict with other land uses. At the time of reclassification, the Service also issued a special rule allowing a maximum of 5,000 Utah prairie dogs to be "taken" annually between June 1 and December 31 in the Cedar and Parowan Valleys in Utah. This program was implemented in August 1984 under a permit system developed by the Division. This system is now covered under the State of Utah's Nongame Mammals Proclamation dated June 23, 1988. On June 14, 1991, the Service amended the special rule to expand the area of "take" to include all private land throughout the range of the species and to increase the maximum numbers of prairie dogs which can be "taken" annually from 5,000 to 6,000. In addition, the rule's quarterly reporting requirement would be replaced by a requirement to make the Division's records on permitted "take" available to the Service, on request.

832. Limit colony density.

Densities of colonies will be managed primarily by natural means to prevent destruction of habitat, increased chance of disease, and significant conflict with other interests.

a. Evaluate use of natural predators as a method of control.

Once the colony is self-sustaining, natural predation will be considered as a management tool to maintain optimum numbers.

b. Evaluate other means of controlling prairie dog colonies.

Other means such as trapping and shooting should be used where necessary to control colony density. In the future, control methods may include poisoning, but this would require the approval of a toxicant for use on the Utah prairie dog.

9. Conduct an information and education program.

On a Statewide and local basis, individuals, agencies, and organizations should be informed of the actions intended to be "taken" and the reasons for those actions.

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PART III

IMPLEMENTATION SCHEDULE

The Implementation Schedule that follows outlines actions and costs for the recovery program. It is a guide for meeting the objectives elaborated in Part II of this plan. This schedule indicates the general category for implementation, recovery plan tasks, corresponding outline numbers, task priorities, duration of tasks, the responsible agencies, and lastly, estimated costs for tasks. These actions, when accomplished, should bring about the recovery of the Utah prairie dog and protect its habitat.

Recovery Action Priorities

Priority 1: An action that must be taken to prevent extinction or to prevent the species from declining irreversibly in the foreseeable future.

Priority 2: An action that must be taken to prevent a significant decline in species population/habitat quality, or some other significant negative impact short of extinction.

Priority 3: All other actions necessary to provide for full recovery of the species.

Abbreviations Used in the Implementation Schedule

BLM--Bureau of Land Management

FS--U.S. Forest Service

FWS--U.S. Fish and Wildlife Service
FWE--Fish and Wildlife Enhancement
LE--Law Enforcement

NPS--National Park Service

UDWR--Utah Division of Wildlife Resources

* - Denotes lead agency for that task

Other Definitions

Ongoing--Task or action which will need to be continued over an undetermined period of time.

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RECOVERY IMPLEMENTATION SCHEDULE
UTAH PRAIRIE DOG

PRIORITY #	TASK #	TASK DESCRIPTION	TASK DURATION	RESPONSIBLE AGENCY FWS REGION	RESPONSIBLE AGENCY FWS PROGRAM	RESPONSIBLE AGENCY OTHER	FISCAL YEAR COSTS (EST.) FY-01	FY-02	FY-03	COMMENTS/NOTES
1	22	Conduct annual spring census.	ongoing			UDWR	5.0	5.5	5.5	
1	42	Select sites for future transplants on public land.	ongoing			UDWR BLM FS NPS	3.0 1.0 1.0 1.0	3.0 1.0 1.0 1.0	3.0 1.0 1.0 1.0	Involves formal meetings and preparation of NEPA documents.
1	51	Determine trapping methodology.	completed			UDWR	--	--	--	Completed in 1986.
1	52	Capture and transport prairie dogs.	ongoing			UDWR	35.0	37.0	39.0	
1	531	Prepare prairie dogs for release.	ongoing			UDWR	--	--	--	Costs included as part of Task #52.
1	532	Prepare transplant sites.	ongoing			UDWR	--	--	--	Costs included as part of Task #52.
1	54	Release prairie dogs.	ongoing			UDWR	--	--	--	Costs included as part of Task #52.
1	55	Revise transplant techniques.	ongoing			UDWR	--	--	--	Costs included as part of Task #52.
1	61	Conduct observational monitoring.	ongoing	6	FWE	 UDWR* BLM FS NPS	0.5 3.0 1.5 0.5 0.5	0.5 3.5 1.5 0.5 0.5	0.5 3.5 1.5 0.5 0.5	Daily or weekly, UDWR to coordinate work. FWS to coordinate funding.
1	62	Radio monitor selected transplanted animals.	ongoing			UDWR* BLM FS NPS	-- -- -- --	-- -- -- --	-- -- -- --	Costs included as part of Task #61.

RECOVERY IMPLEMENTATION SCHEDULE
UTAH PRAIRIE DOG

PRIORITY #	TASK #	TASK DESCRIPTION	TASK DURATION	RESPONSIBLE AGENCY FWS REGION	FWS PROGRAM	OTHER	FISCAL YEAR COSTS (EST.) FY-01	FY-02	FY-03	COMMENTS/NOTES
2	211	Examine aerial photos for active prairie dog colonies.	1 year			UDWR*	1.0	--	--	Have initiated but not completed.
						BLM	0.5	--	--	
						FS	0.5	--	--	
						NPS	0.5	--	--	
2	212	Conduct aerial searches of historical range.	ongoing			UDWR*	--	--	--	Costs included in task #211.
						BLM	--	--	--	
						FS	--	--	--	
2	213	Conduct ground searches.	ongoing			UDWR*	--	--	--	Costs dependent on the number of prospective sites located in task #212.
						BLM	--	--	--	
						FS	--	--	--	
2	23	Validate current census techniques.	1 year	6	FWE		20.0	--	--	
2	3 ALL	Determine what factors influence colony viability.	completed	6	FWE	UDWR*	--	--	--	Studies have been completed.
						BLM	--	--	--	
						FS	--	--	--	
2	41	Protect habitat or secure management authority on private land.	ongoing			UDWR	0.5	0.5	0.5	Only covers costs for identifying needed work. Acquisition or other land protection costs have not been identified.
2	71	Enforce laws.	ongoing	6	FWE, LE		1.0	1.0	1.0	Violation of State & Federal laws or taking as defined under the Endangered Species Act will be investigated.
						UDWR	2.0	2.0	2.0	
						BLM	1.0	1.0	1.0	
						FS	1.0	1.0	1.0	
						NPS	1.0	1.0	1.0	
2	72	Monitor land use.	ongoing	6	FWE		2.0	2.0	2.0	Includes Section 7 consultation.
						UDWR	1.0	1.0	1.0	
						BLM	1.0	1.0	1.0	
						FS	1.0	1.0	1.0	
						NPS	1.0	1.0	1.0	

RECOVERY IMPLEMENTATION SCHEDULE
UTAH PRAIRIE DOG

PRIORITY #	TASK #	TASK DESCRIPTION	TASK DURATION	RESPONSIBLE AGENCY FWS REGION	FWS PROGRAM	OTHER	FISCAL YEAR COSTS (EST.) FY-01	FY-02	FY-03	COMMENTS/NOTES
2	811	Modify active colonies and successful transplant sites.	ongoing			UDWR	--	--	--	
						BLM	--	6.0	6.0	
						FS	--	7.0	7.0	
						NPS	1.0	--	--	
2	812	Modify proposed transplant sites.	ongoing			UDWR*				
						BLM	2.5	2.5	2.5	
						FS	5.0	5.0	5.0	
						NPS	5.0	5.0	5.0	
2	821	Control predators as necessary.	ongoing			UDWR	0.5	0.5	0.5	
2	831	Limit distribution.	ongoing	6	FWE		1.0	--	--	A control program has been established and administered by UDWR.
						UDWR	1.0	1.0	1.0	
2	9	Conduct information and education program.	ongoing	6	FWE		0.5	0.5	0.5	
						UDWR	0.5	0.5	0.5	
						BLM	0.5	0.5	0.5	
						FS	0.5	0.5	0.5	
						NPS	1.0	1.0	1.0	
3	1 All	Determine historical range and species distribution.	10 years			UDWR	--	--	--	Will be accomplished in conjunction with other work.
3	822	Implement habitat management plans.	ongoing			BLM	0.5	0.5	0.5	Each agency to manage Utah prairie dog habitat on lands administered by them.
						FS	0.5	0.5	0.5	
						NPS	0.5	0.5	0.5	
3	832	Limit colony density.	ongoing			UDWR	--	--	--	Costs determined if control is needed.
Totals:							109.0	100.0	102.0	

PART IV - APPENDICES

Appendix A - Number of acres occupied by Utah prairie dogs and the number of acres treated with rodenticide from 1925 through 1933 for counties within the historical range of *Cynomys parvidens*.

	Garfield		Iron		Piute		Sevier		Wayne	
Year	Occupied	Treated	Occupied	Treated	Occupied	Treated	Occupied	Treated	Occupied	Treated
1925	88,150	56,000	112,460	11,400	1,750	120	--	--	--	--
1926	32,150	3,000	101,060	--	18,000	2,000	--	--	--	--
1927	29,150	16,000	101,060	--	--	--	--	--	--	--
1928	20,000	14,750	100,000	5,000	16,000	7,000	--	3,750	124,800	9,200
1929	--b	--	--	--	--	--	--	--	--	--
1930	457,837	72,290	102,900	20,000	44,768	28,000	47,266	2,000	316,928	800
1931	79,770	2,000	102,900	0	22,155	0	94,530	9,900	17,462	0
1932	--	2,000	108,000	2,000	54,268	5,000	46,266	100	316,000	0
1933	507,000	4,950	102,000	2,000	34,268	1,660	46,264	0	316,928	148,000

[a] Information taken from Bureau of Sport Fisheries and Wildlife Annual Reports, 1925-1933.
[b] Data unavailable

Appendix B - Guidelines For Selecting a Transplant Site

1. The area must be well-drained. A prairie dog must be able to inhabit a burrow system 1 meter underground in an area at any time without becoming wet.

2. The soil in the burrow area must not easily cave in. The soil must not be sand or loamy sand. Caliche layer below the 4 foot level.

3. Elevation does not appear to be a limiting function in transplants. Cedar Valley (5500 feet) prairie dogs have been moved to Tidwell Slopes (9200 feet) with equal success when compared to Loa (8000 feet) prairie dogs.

4. The site should be ranked higher if it has evidence of old mound systems.

5. The site should not have vegetation so dense or high that it prohibits the dogs from seeing through or over it. Vegetation should be chopped off prairie dog mounds if over 12 inches.

6. Moist swale vegetation in the form of grasses, forbs, and shrubs (rabbitbrush [Chrysothamnus sp.] is beneficial) must be available throughout the period of Utah prairie dog activity above ground. Moist vegetation is particularly essential in drought years and the dry months of June through August. And should be located with 600 feet of the home burrow area throughout summer.

7. Because of the importance of providing sites with the proper vegetation, specific recommended vegetative parameters are suggested:

Vegetation Parameters

	Recommended Range (%)		Minimum (%)	Maximum (%)
Total canopy cover	25-45		20	85
Cool season grasses*	20-40	1,890 meters	0	70
		1,890 - 2,591 meters	1-5	70
		2,591 meters - above	5-15	70
Warm season grasses	5-10		0	40
Forbs	5-15		0+	40
Shrubs (other than rabbitbrush)	0-0		0+	15
Rabbitbrush	1-3		0+	15

* The minimum requirements for cool season grasses vary with different elevations.

+ Some flowers and seeds of dicots must be available from mid-June to September, but it doesn't take many flowers to feed a population of prairie dogs.

8. The prairie dog transplant sites should be one mile from private land. Suitable barriers such as trees, rock out crops and ledges should be between transplant sites and private land if the sites are closer to private land.

9. The average breeding date of transplant stock is not a factor. Length of hibernation varies with winter conditions.

10. Dogs at higher elevations need higher quality sites because of need for better storage to finish life history states in shorter amount of time.

Vegetative Parameters For Sites Above 7000 Feet*

	Recommended Range (%)	Ideal (%)
Total canopy cover	35-45	42
Grasses	10-45	35
Cool season	10-40	30
Warm season	1-20	5
Forbs	1-10	5
Shrubs	1-40	2

* From Coleman Crocker-Bedford's work.

Crocker-Bedford estimates the predicted abundance index for the site should be at least 36. A regression was determined that explains 79% of the variation between the abundance indices of 19 rangeland colonies.

Abundance Index = 138.2

- 0.0144 x elevation in feet

+ 2.16 x percent of cool season grass canopy cover up to 20%

- 0.0713 x average distance from home burrows to swale in meters

+ 7.27 x wetness of swale *

Wetness of swale in midsummer:

0 = brown grasses and forbs

1 = green grasses and forbs that are fairly dry

2 = green grasses and forbs that are moist

3 = soggy ground

* The above equation will be used to calculate the predicted abundance index.

Criteria Relating to Potential Problems:

Prairie dogs transplanted to a site must have little chance of causing range problems. When prairie dogs consume ten percent of the annual forage production of grasses and forbs they induce a decline in the production of palatable perennials (Crocker-Bedford 1976). Such consumption occurs when the abundance index reaches approximately 78; thus, the predicted abundance index should be below 78 for transplanting to be allowed.

Typically, when the abundance index is below 60, prairie dogs consume less than three percent of the yield of grasses and forbs within a colony.

Prairie dogs transplanted to a site could migrate to potential habitat not managed by a Federal agency. The Utah Division of Wildlife Resources feels that once the control program is extended to all the private lands within the current range, that control should be relatively easy on colonies that expand into private lands.

Crocker-Bedford estimates that transplanted prairie dogs would require 5 years to expand and migrate 2 miles from a transplant site. Dispersal is greatly restricted by a river, cliff, forest, or dense stand of tall shrubs. Such barriers could inhibit migration for a few years. Thus 2 mile minimum or barrier should be separating criteria.

Future supplemental translocations will have to be conducted on a regular basis in order to maintain the gene pool for long-term viability.

Appendix C - Percent of Total Prairie Dogs Per Area

Area	1976			1977			1978			1979			1980		
	% of Total	Census Total	Active Colony	% of Total	Census Total	Active Colony	% of Total	Census Total	Active Colony	% of Total	Census Total	Active Colony	% of Total	Census Total	Active Colony
Cedar Valley	29.0	627	21	39.6	918	24	54.8	1849	32	59.0	1697	31	60.6	1872	31
Panguitch Valley	27.1	585	14	17.2	398	16	9.4	316	18	10.0	287	21	14.4	446	20
Johns Val./Bryce	19.3	417	4	20.0	464	4	14.4	487	5	7.8	223	6	7.1	220	7
Loa	3.9	85	3	3.7	86	3	2.1	72	3	2.4	68	4	3.6	111	6
Awapa	4.4	95	6	10.9	253	8	14.0	471	12	15.7	452	12	6.3	194	13
Miscellaneous	16.3	351	3	7.4	172	4	2.1	72	4	1.8	52	4	2.6	79	3
Transplants	0.0	0	0	1.3	29	3	3.2	108	5	3.4	98	6	5.4	168	11
Totals	100	2160	51	100	2320	62	100	3375	79	100	2877	84	100	3090	91
Colony Categories by Land Ownership															
Private	81.3	1755	40	77.5	1798	45	77.1	2603	55	74.4	2141	58	83.0	2565	62
Public	5.9	127	10	15.3	356	13	19.4	655	17	21.7	625	19	11.1	342	17
Combined	12.9	278	1	5.9	137	1	0.3	9	2	0.5	13	1	0.5	15	1
Transplants	0.0	0	0	1.3	29	3	3.2	108	5	3.4	98	6	5.4	168	11
Totals	100	2160	51	100	2320	62	100	3375	79	100	2877	84	100	3090	91
Public plus Transplants*	5.9	127	10	16.6	385	16	22.6	763	22	25.0	723	25	16.5	510	28

* Figures exclude combined colonies. The percentage is of Public plus Transplant total.

Appendix C - Percent of Total Prairie Dogs Per Area (continued)

Area	1981			1982			1983			1984			1985		
	% of Total	Census Total	Active Colony	% of Total	Census Total	Active Colony	% of Total	Census Total	Active Colony	% of Total	Census Total	Active Colony	% of Total	Census Total	Activ Colon
Cedar Valley	65.2	3056	32	68.7	3689	33	72.1	2881	57	62.1	2293	55	51.7	2113	48
Panguitch Valley	12.3	578	20	10.4	560	17	12.7	506	21	12.0	444	29	15.2	623	21
Johns Val./Bryce	8.1	382	6	3.7	200	6	3.6	145	6	8.6	316	8	12.1	494	10
Loa	3.2	148	6	2.6	138	4	0.8	31	2	1.6	60	5	3.1	126	5
Awapa	2.1	99	9	4.1	218	13	3.4	134	9	5.7	211	17	6.3	258	15
Miscellaneous**	2.6	124	2	3.7	201	3	--	--	--	--	--	--	--	--	--
Transplants	6.4	302	12	6.8	365	16	7.4	297	15	9.9	366	16	11.6	472	23
Totals	100	4689	87	100	5371	92	100	3994	110	100	3690	130	100	4086	122
Colony Categories by Land Ownership															
Private	86.6	4063	58	86.4	4643	57	76.6	3059	68	70.2	2592	80	55.0	2246	72
Public	6.4	300	16	6.8	363	19	8.3	331	24	14.4	530	30	17.1	697	23
Combined	0.5	24	1	0.0	0	0	7.7	307	3	5.5	202	4	16.4	671	4
Transplants	6.4	302	12	6.8	365	16	7.4	297	15	9.9	366	16	11.6	472	23
Totals	100	4689	87	100	5371	92	100	3994	110	100	3690	130	100	4086	122
Public plus Transplants*	12.8	602	28	13.6	728	35	15.7	628	39	24.3	896	46	28.6	1169	46

* Figures exclude combined colonies. The percentage is of Public plus Transplant total.

** This category was combined with other categories in 1983.

Appendix C - Percent of Total Prairie Dogs Per Area (continued)

Area	1986 % of Total	1986 Census Total	1986 Active Colony	1987 % of Total	1987 Census Total	1987 Active Colony	1988 *** % of Total	1988 *** Census Total	1988 *** Active Colony	1989 % of Total	1989 Census Total	1989 Active Colony	1990**** % of Total	1990**** Census Total	1990**** Active Colony
Cedar Valley	55.1	3012	46	39.8	2220	47	61.2	3660	--	54.2	3969	--		NA	
Panguitch Valley	14.2	779	25	23.6	1316	27	14.3	855	--	11.7	905	--		NA	
Johns Val./Bryce	10.9	598	11	15.5	865	9	6.6	392	--	4.7	351	--		253	
Loa	2.9	157	7	1.8	102	8	2.1	126	--	1.4	106	--		65	
Awapa	5.4	294	14	6.5	362	16	3.5	212	--	12.2	893	--		283	
Transplants	11.5	631	20	12.7	709	20	12.3	739	--	15.8	1153	--		497	
Totals	100	5471	123	100	5574	127	100	5984	--	100	7377	--		1098	
Colony Categories by Land Ownership															
Private	53.8	2941	74	48.5	2703	73	57.9	3463	58	49.1	3622	--	--	NA	--
Public	16.5	903	25	20.6	1147	27	10.2	613	22	17.7	1306	28	--	452	--
Combined	18.2	996	4	18.2	1015	7	19.5	1169	9	17.6	1296	10	--	NA	--
Transplants	11.5	631	20	12.7	709	20	12.3	739	17	15.6	1153	18	--	497	--
Totals	100	5471	123	100	5574	127	100	5984	106	100	7377	--			
Public plus Transplants*	28.0	1534	45	33.3	1856	47	22.6	1352	39	33.5	2459	46		969	

* Figures exclude combined colonies. The percentage is of Public plus Transplant total.

*** Colonies dropped in 1988. Number of complexes will be used in the future.

**** Because of a program decision in February 1990, spring counts were only conducted on public land. Thus a number of the table summaries cannot be done for 1990 and are marked NA (not available).

Appendix D - Utah Prairie Dog Transplant Data

Year/Number of Utah Prairie Dogs Transplanted

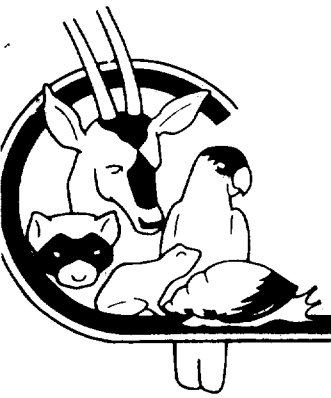
SITE	OWNER	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	TOTAL
Eliker Basin	State	29	25	105	82																241
W. Eliker Basin	BLM		12																		12
Parowan Front	BLM		21																		21
Dog Valley	BLM		44				8									122	250	157	160	86	827
Bryce Canyon	NPS			46	214	109	114	100						140	333	410	444				1910
Ruby's Inn	Priv			96																	96
Three Peaks	BLM			263	100	30	167	286					12			13	14	154	1		1040
Buckhorn Flat	BLM			10	26																36
Black Point	BLM					83															83
Buckskin Valley	BLM					536	186	230	22										183		1157
Frying Pan Flat	BLM					95															95
Flat Tops	BLM						314	209													523
Tom Best	FS-Di						62	105			54		16								237
Minersville #3	BLM								214												214
Pine Valley #8	BLM								113							100		25			238
Pine Valley #9a	State								59	4											63
Pine Valley #9b	BLM									178											178
Pine Valley #10a	BLM						50						239	5		72	162	134	270	199	1131
Pine Valley #10b	BLM									77											77
Pine Valley #11	BLM						154														154
Pine Valley #12a	BLM								100												100
Pine Valley #12b	BLM									13									118		131
Lund - West	BLM									6			488			101	102	42	20		759
Bear Valley	FS-Di								77												77
Berry Springs	FS-Di								41		81	152	169	17			142		183	128	913
Frying Pan Creek	FS-FL								70		75	53									198
Pelican Point	FS-FL									54	21	23				93	61	45	124	30	451
Coots Slough	FS-FL									10	79	65		24		84	50	82		70	464
Crater Lakes	FS-FL																				NA
Johnson Bench	FS-FL									98	43										141
Ahlstrom Hollow	FS-Di									62			21								83
Capitol Reef	NPS									200											200
Long Hollow	BLM										55	92							140	482	769

Appendix D - Utah Prairie Dog Transplant Data (Continued)

SITE	OWNER	Year/Number of Utah Prairie Dogs Transplanted																			
		1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	TOTAL
Guymon Seep	BLM										85	137									222
Willow Spring	BLM										83	189									272
Indian Peak	DWR											58									58
Reynolds Spring	FS-Di											75	7								82
Rocky Reservoir	FS-FL											139	100	70	44	11					364
North Lund	BLM												48								48
Horse Hollow	BLM												114	145	123	152	189	44			767
Tidwell Slopes	FS-FL													87	52	105	152	169	217		782
Yearly Totals		29	102	520	422	853	1055	930	696	702	576	983	1214	488	552	1263	1566	852	1416	995	15214

Appendix E - 1987 Ad Hoc Recovery Team Members

Scott Bell, Loa Ranger District, U.S. Forest Service
Ray Blaisdell, Bureau of Land Management
Robert Benton, U.S. Fish and Wildlife Service
Marianne Breeze, Dixie National Forest, U.S. Forest Service
George Buckingham, Bryce Canyon National Park, National Park Service
Marion Cherry, U.S. Forest Service
Dr. Tim Clark, Department of Biology, Idaho State University
Mike Coffeen, Utah Division of Wildlife Resources
Mike Rath, U.S. Forest Service
Jordan Pederson, Utah Division of Wildlife Resources
Skip Greip, Dixie National Forest, U.S. Forest Service
Noel Poe, Capitol Reef National Park, U.S. Park Service
Steve Hedges, Cedar City District, Bureau of Land Management
Ken Kehrer, Capitol Reef National Park, U.S. Park Service
Linda Kerr, Bryce Canyon National Park, National Park Service
Bert Lowry, Fishlake National Forest, U.S. Forest Service
Blaine Lunceford, Bureau of Land Management
Hugh Thompson, Dixie National Forest, U.S. Forest Service
Larry Maxfield, Richfield District Office, Bureau of Land Management
Paul Sawyer, Richfield District Office, Bureau of Land Management
Ed Story, Utah Division of State Lands & Forestry
Jay Kent Taylor, Fishlake National Forest
Ron Tucker, Beaver River Resource Area, Bureau of Land Management
Dr. Steve Wisenant, Department of Botany & Range Science, Brigham Young Univ.
Mary Ann Wright, Utah Division of Oil, Gas, & Mining
Robert N. Hasenyager, Utah Division of Wildlife Resources



Captive Breeding Specialist Group

Species Survival Commission
International Union for the Conservation of Nature and Natural Resources
U. S. Seal, CBSG Chairman

23 October 1987

Utah Prairie Dog Recovery Plan

Advisory Meeting

Salt Lake City, Utah

Captive Breeding Specialist Group

Utah Division Wildlife Resources

U. S. Fish & Wildlife Service

COMMENTS & RECOMMENDATIONS

Participants: U. S. Seal (CBSG), R. Lacy (CBSG & Brookfield Zoo), J. Roybal (USFWS, Denver), R. Benton (USFWS, Salt Lake City), Mike Coffeen. (Utah DWR), Ken Elowe (Utah DWR), and Mary-Ann Wright (Biologist with Utah Prairie Dog field experience).

The CBSG was requested by Dr. John Green, Assistant Regional Director (Federal Assistance) of Region 6, USFWS to review the Utah Prairie Dog (Cynomys parvidens) Recovery Plan draft and related documents. We were specifically asked to comment or offer assistance concerning establishment of recovery goals and maintenance of viable populations for this species.

A preliminary meeting was held (Seal, Flesness, Roybal, and Benton) at Bozeman, MT (August, 1987) to discuss the problems that needed analysis and comments that had resulted from reviews by several members of CBSG. We also itemized needed and possibly available biological information that would be useful for establishing goals for recovery of the species. It was agreed to meet in the fall to prepare a working set of recommendations for the recovery plan based upon a review of the available biological information.

Information requested, that would be useful for preparing a recovery plan based upon principles of small population biology, included:

1) Areas for maintenance, release, and reestablishment of populations.
   a) Current populations
   b) Proposed or ecologically possible areas
   c) Discreteness of areas (locations on suitable map)
   d) Sizes and carrying capacities for breeding adults

2) Life history characteristics.
   a) Age & sex specific mortality
   b) Age & sex specific fecundity
   c) Sex ratio of breeders
   d) Life time family sizes
   e) Generation time
   f) Male breeding success - ie randomness of breeding
   g) Litter sizes and survival to breeding season

3) Taxonomic status.
   a) Status as a species relative to C. leucorus
   b) Separation of populations within species
   c) Genetic diversity (heterozygosity) information

4) Release and relocation programs
   a) What is working?
   b) Sources of animals?

5) Environmental variables impacting demography
   a) Disease - Plague
      1. Infection rate of colonies
      2. Survival rate with infection
      3. Recovery following an epidemic
      4. Reinfection probability
      5. Recolonization potential and kinetics

   b) Climate and weather
      1. Variation in over winter survival - random with respect to age and sex?
      2. Moisture and rainfall - short & long term cycles.

   c) Predation

   d) Poisoning practices & land use conflicts

   e) Species interactions

6) Census (variance estimates)

a) Accuracy and Reliability

b) Age, sex, and seasonal dependency

c) Evidence for stability of large and small present or historical colonies?

This report summarizes the results and recommendations of the Salt Lake City meeting based upon the data available to the people present at the meeting.

Additional information in current records that would be useful for the analyses was identified. Important data that might be collected as a part of ongoing control and translocation programs was also identified.

RECOVERY PLAN - Comments and Recommendations

1. The discussion was initiated with questions concerning the legal definition of recovery in the context that the species is listed under the Endangered Species Act. The goal is achievement of 'self-sustaining' and 'viable' population(s) of the species which would allow delisting of the species. It is understood that continuing management of a species might be necessary - usually by state agencies - to assure that the species remains secure. This population goal has genetic and demographic implications for formulation of recovery plan objectives.

2. Agreement on terminology of animal groupings is necessary for consistent use in the following analysis.

a) Colonies are groups of animals with associated mounds, burrows, and food resources that are within calling distance. These units are genetically panmictic and vulnerable to local catastrophe including disease outbreaks.

b) Complexes are groups of colonies that are within 2 miles of each other, not separated by geographic barriers, and will exchange migrants each 1-2 generations.

c) Populations are groups of complexes within an geographic area that are not separated by geographic barriers but are

generally separated by distances greater than 2 miles. With colony growth and extension the complexes can potentially exchange migrants every few generations. A population has the potential for becoming a complex. Disease vulnerability will become greater if the population does become a complex.

d) Species distribution includes populations separated by geographic barriers that cannot accomplish genetic exchange without management assistance.

3. Genetic implications of the goals stated in Recommendation 1 above are that the species be present in sufficient numbers to allow selection and adaptation to changing environments over time to occur. Thus loss of genetic diversity or a change in its pattern in populations of the species would be the result of natural selection rather than drift or loss because of too small numbers. There is also the implication that numbers should be sufficient to allow replacement or accumulation of genetic diversity to occur through time by the processes of mutation, drift, and selection. The minimum numbers to meet such a criterion cannot be precisely defined at present. However it is clear that rational recovery objectives require inclusion of a time criterion - especially if there is a need to identify minimum population levels to satisfy criteria of 'self-sustaining' or 'viable' populations.

4. Demographic implications are that populations of the species be distributed through its range in a way that the species is protected against loss through catastrophe whether 'natural' or human induced. The minimum nunbers within a population will be determined in part by the goal Ne, in part by the oscillations which occur, the number and distribution of complexes, and estimates of the probability of a given population going extinct within a specified time period. Any population that does go extinct will need to be reconstituted by transplants from the other populations.

5. These considerations suggest formulation of recovery plan population objectives according to (1) retention of genetic diversity, (2) demographic stability, (3) duration or time for the population to meet the genetic and demographic criteria, and (4) intensity of management effort required to meet the genetic, demographic and time criteria.

Recovery Plan Objectives:

It is the recommendation of the CBSG that the fundamental objective for recovery of a species is to achieve a self-sustaining, viable species distribution of Utah Prairie dogs that will not lose average genetic diversity for 200 years.

We suggest that an achievable recovery plan goal, that may allow accomplishment of the fundamental goal, would be:

> A self-sustaining, viable species distribution with retention of 90% of genetic diversity for 200 years.

We recognize that currently there is need for intense management effort to achieve this goal through establishment of secure populations that will meet the genetic and demographic goals of the plan.

Biological Data Sets:

1) Available information:

a) Life table information - there is uncertainty about the age structure of this species even at the colony level.

Females: The best estimate suggested for the present is that the females live and reproduce for a maximum of 4 years. We assumed that there is age dependency for fecundity - i.e the litter for each age class is the same. The age of first reproduction is one year (11 months of age at insemination) and the species is seasonally reproducing with one litter per year. The ovulation and implantation rates are not known but could be obtained from the control program animals. Average litter size at emergence from the burrow is about 3.5. This number will require validation and further study. It is likely to be population and year dependent. It is assumed that 90% or more of all females will be bred each year. Sex ratio of litters at emergence is equal. Knowledge of the age structure will allow calculation of generation time given the above assumptions of reproductive efficiency at each age.

Males: Males may live and reproduce for up to 4 years. Information on the ratio of breeding males to females is lacking. Information on the ratio of adult males to adult females can be obtained from available trapping data. Sex information is not obtained from the spring census counts. A first level assumption would be that about 70% of adult males breed successfully each year. An evaluation of this ratio is essential for estimation of

the effective population size. This calculation is key for estimates of census population sizes needed to meet recovery objectives.

The species is promiscuous and may approximate random breeding within a colony. Sex and age specific mortality estimates can be extracted from currently available data. This should be a high priority since it will influence the numerical estimates of population sizes needed to meet recovery plan objectives.

Spring census data of adults from the past 10 years appear adequate to allow estimates of species fluctuation in numbers. Available data also allow estimates of fluctuations at the population and complex level. These data are important for estimates of the number of populations that it will be necessary to establish and maintain to assure meeting of species recovery objectives.

Areas and Population:

The CBSG supports the objective of securing the recovery of the species through establishment and maintenance of the species on public lands. Colonies on private lands will contribute to the species but cannot be assured, at present, of long-term multigeneration survival as populations.

Identified populations on public lands, their current census and estimated carrying capacities are:

		Census	Capacity
1)	West Desert	50	400
2)	Paunsaugannt Plateau	870	1500
3)	Parker Mountain	360	2000
4)	Bald Hills	500	2000

The populations primarily on private lands are:

1) Cedar Valley current spring census = 1700

2) Panguitch Valley " " " = 450

Potential addition geographic areas for populations on public

lands are:

1) Dog Valley area potential cc = 500

2) Panguitch lake area " = 500

3) Tidwell Slopes area " = 750

Estimates of spring census numbers of adult animals for the species and its populations that will be required to meet recovery plan objectives for delisting the species.

Suggested numerical estimates of the census numbers required for meeting recovery plan objectives for the species will depend upon the demographic and genetic requirements to meet the 200 year objective for a self sustaining population.

The genetic estimates depend upon estimates of the effective population size and its fluctuations from generation to generation. The value of the long term harmonic mean of the Ne estimates would serve as the critical value of the Ne to meet the genetic criteria for long term management of the species and its populations.

Given the risk of loss of individual populations to environmental stochasticity it is recommended that each population be established at level of Ne to meet the criterion of self-sustaining for 200 years. It is then necessary to develop estimates of the probability of population extinction to allow an estimate of the number of populations that are necessary to meet the recovery plan goal of 200 years survival with retention of 90% of genetic diversity.

An estimate of the numbers required to meet the genetic criteria for a population include the following estimators:

a) The first level estimate without correction is that Ne is equal to the spring census size which is composed of adults without young of the year.

b) Equal sex ratio with 70% males breeding yields an effective population size correction of 82% of the spring census Ne estimate.

c) Litter size variance correction does not appear to be necessary.

d) Population size fluctuations (Ne - harmonic mean) about 75% of mean of Ne over the 10 year period.

With all corrections considered, the correction factor for Ne would be about 62% of the spring census estimate.

To get a long-term harmonic Ne of 500, one will need long-term arithmetic mean Ne of 667 which means spring adult animal count of 813 for each population. (Thus Parker Mountain has about 30% of animals needed).

It is also important to consider recovery throughout the historical range of the species. Establishment of additional populations at different locales will further enhance the survival of the species and provide a greater oportunity for accumulation of genetic diversity.

Additional work on estimating the number of populations needed to meet various recovery goals is underway. These estimates should be available within about 10 days. Also other members of our group will review the results presented here and may have comments which I will transmit to you.

It was a great pleasure for us to work with Roybal, Benton, Coffen, and Elowe. They are knowledgeable, thoughtful, helpful, and assets to both agencies.

Sincerely,

U. S. Seal, Chairman
Captive Breeding Specialist Group IUCN/SSC
Bld. 49 Room 207
V A Medical Center
Minneapolis, Minnesota 55417

cc: Lacy, CBSG, Roybal, Benton, Coffeen, Elowe, and Wright

APPENDIX G

SUPPLEMENTAL INFORMATION

This recovery plan was made available to the public for comment as required by the 1988 amendments to the Endangered Species Act of 1973. The public comment period was announced in the Federal Register (56 F.R. 26831) on June 11, 1991, and closed on July 26, 1991. Over 100 press releases were sent to the print media located in the State of Utah.

During the public comment period three letters were received. The comments provided in these letters have been considered, and incorporated as appropriate. Comments addressing recovery tasks that are the responsibility of an agency other than the U.S. Fish and Wildlife Service have been sent to that agency as required by the 1988 amendments to the Act.