

**Prairie Cluster Long-Term
Ecological Monitoring Program**

**Program Report
00-001**

**Annual Status Report:
1998 Black-tailed Prairie Dog Monitoring for
Scotts Bluff National Monument**



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1998 Black-tailed Prairie Dog Monitoring for Scotts Bluff National Monument

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INTRODUCTION

Prairie dogs (*Cynomys* sp.) once inhabited about 10-20% of the short and mixed-grass prairies of the United States (Anderson et al. 1986) but less than 1% of this historic range remains occupied (U. S. Fish and Wildlife Service 2000). The proximate causes for this decline include habitat loss due to conversion to cropland, urbanization, habitat modification and fragmentation, disease and poisoning (U. S. Fish and Wildlife Service 2000). Additionally, the introduction of sylvatic plague (*Yersinia pestis*) into North America is presumed to be capable of causing massive prairie dog dieoffs (Barnes 1993; Cully 1993). The past and present status of the black-tailed prairie dog, *Cynomys ludovicianus*, (BTPD) in lands managed by the National Park Service (NPS) is poorly known. There are twenty-nine NPS units within the historic range of the BTPD. Twelve units historically supported BTPDs, but only seven units currently have BTPD populations.

Continual herbivory by BTPDs modifies the morphology, structure, and plant nutritive value of individual plants (Cid et al. 1989; Brizuela et al. 1986; Detling and Painter 1983; Holland and Detling 1990; Jaramillo and Detling 1988). The duration of colonization modifies the microhabitat along a disturbance gradient resulting in altered rates of microbial activity, nutrient cycling in soils, and water balance in plants (Archer and Detling 1986; Holland and Detling 1990; Whicker and Detling 1988). These impacts create a habitat mosaic has been suggested to be beneficial to other species (Agnew et al. 1986; Sharps and Uresk 1990) such that in mixed prairie, approximately 40% of vertebrate wildlife species have some association (i.e., from obligate to accidental) with prairie dog colonies (Sharps and Uresk 1990). However, the small size and isolation of "island" fragments increase their vulnerability to changes in land-use, disturbance regimes, and diseases.

BTPD monitoring at Scotts Bluff National Monument (SCBL) and six other prairie parks began in 1995 to collect baseline data while simultaneously developing a monitoring protocol for the NPS Prairie Cluster Long-term Ecological Monitoring program.

OBJECTIVES

The objective of BTPD monitoring is to determine: 1) BTPD abundance, 2) size and location of BTPD colonies, by producing annual colony maps, and 3) surveillance of sylvatic plague.

METHODS

BTPD Abundance

The BTPD monitoring methodology is detailed in Plumb et al. (2000). There is only a single BTPD colony (<16 ha), at SCBL, so the entire colony is included in the counting. Sampling should be carried out during June-July when: a) vegetation is at or near peak development but prior to senescence, b) following emergence and prior to dispersal of young-of-the-year BTPD, and c) when the BTPD-induced vegetation clip line colony "edge" is most easily discerned. Eight replicate counts, with 15 minute intervals between replicates, are made on each

of three successive days. Counts should be completed between 1000 - 1100 hours each morning.

Using the visual count data two calculations are carried out to arrive at an estimate of the BTPD metapopulation within the park, for each sampling date:

1. *Density Index* - Calculate the estimated population density index as:

$$DI = [(X = Y - 3.04 / 0.40) / S_p],$$

where X is the predicted abundance of individuals, Y is the maximum count of individuals in the sample plot or colony for a single replicate; and S_p is the respective size of the replicate plot or entire colony (Severson and Plumb 1998).

2. *Population Abundance* - The population abundance index (PAI) is the final calculation used to estimate the BTPD metapopulation within the park. The PAI is calculated as:

$$PAI = (\sum DI / N)(\sum S_c),$$

where DI is the replicate plot Density Index (above), N is the number of replicate sample plots, and S_c is the colony size. [Note: In small parks where the whole colony is counted, $S_c = S_p$. In larger parks, colony complex size ($\sum S_c$) is the sum of the areas of all colonies].

BTPD Colony Mapping

Plumb et al. (2000) describes in detail the use of a Global Positioning Systems for delineating irregular land surface polygon boundaries and sizes in conjunction with PC based Geographic Exploration Systems such as ArcView™.

Before conducting GPS mapping, use colored pin flags to mark the edge of the colony. Select a starting point, mark this point with a flag, and begin walking the colony edge in either direction, following the vegetation clip line. When the continuity of a vegetation clip line disappears or cannot be reasonably determined, continue to encircle the colony with an imaginary line which incorporates the extent of the active burrows (e.g., > 7 cm burrow opening with fresh scat within 0.5 m, *sensu* Biggins et al. 1993) within five meters of actively grazed vegetation. There may be exploratory burrows at great distances from the main colony, but burrows > 5 meters from actively grazed ground should be excised. Otherwise, extensive areas of uncolonized grassland could be included. While walking the colony edge, place the pin flags approximately 10 meters apart or at shorter, reasonable intervals which will clearly delineate undulating changes in the perimeter of the colony polygon. Completely walk the entire colony edge, arriving back to the initial flag, thus closing the colony polygon.

Vegetation Monitoring

No vegetation monitoring is currently being done in the SCBL BTPD colony.

Sylvatic Plague Surveillance

Sylvatic plague is not known to be active in BTPD population(s) in any NPS unit. Small parks like SCBL which has only one BTPD colony are at highest risk of local extinction due to

wildlife disease. In the absence of an ongoing epizootic, sylvatic plague surveillance takes the form of low-level local sampling paired with consistent liaison with state and local health departments and an informal surveillance network of biologically-oriented public agencies and individuals (Barnes 1982). Upon evidence of activity or detection of plague locally, further surveillance should be carried out by the appropriate state and local health agencies.

Park staff should conduct an annual visual survey, denoting on a copy of the digital colony map, the estimated spatial extent of the active colony and a visual estimate of prairie dog numbers (0-10, 10-30, 30-120, 120-360, > 360). Surveys should be done between 0800-1000 (period of peak BTPD activity) with clear sky and low wind. Plotting abundance and distribution estimates across years will generate long-term trends from which dramatic, order of magnitude deviation, indicative of substantial mortality and possible plague outbreak, can be detected. Upon evidence of activity or detection of plague locally, further surveillance should be carried out by the appropriate state and local health agencies. Contacts to be alerted at this level of concern are listed below (Appendix A).

RESULTS

BTPD Abundance

The results of BTPD monitoring between 1995-1998 are given in Table 1, and presented graphically in Figure 1. Density of BTPDs increased 137% between 1995 and 1997, declining slightly between 1997 and 1998. Colony size was unchanged over the first two years of study, but subsequently also increased 136% by 1998. The increase in colony size has resulted in a continual increase in the estimated park population of BTPD, despite the slight decrease in population density over the last two years. The estimated BTPD population has increased over 360% during the period of study.

It is unknown to what extent important factors like vegetation dynamics or weather may have caused the recent increases in the BTPD population. Long-term monitoring of these parameters in conjunction with continued monitoring of BTPDs will provide the best information for park managers to assess the magnitude of population changes and the causes of these fluctuations of BTPD numbers.

BTPD Colony Mapping

Maps showing the changes in the size, shape and location of the BTPD colony at Scott's Bluff are shown in Figures 2-5. These figures show that not only has the area of the colony within the clip line increased over time, but the shape has changed as well. The most recent maps indicate that the colony exists as several discrete patches (Fig. 5).

BTPD Plague Surveillance

To date, active surveillance for plague has not been carried out at SCBL. Plague has not occurred at SCBL, and no indication of its occurrence was found during abundance surveys.

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Table 1. Estimated population density, colony size, and estimated population size of black-tailed prairie dogs at Scott's Bluff National Monument, 1995-1998.

Year	Population Density (individuals ha ⁻¹)	Colony Size (ha)	Population Size (individuals park ⁻¹)
1995	14.2	1.4	19.9
1996	24.0	1.4	33.6
1997	33.6	2.6	87.4
1998	28.2	3.3	92.0

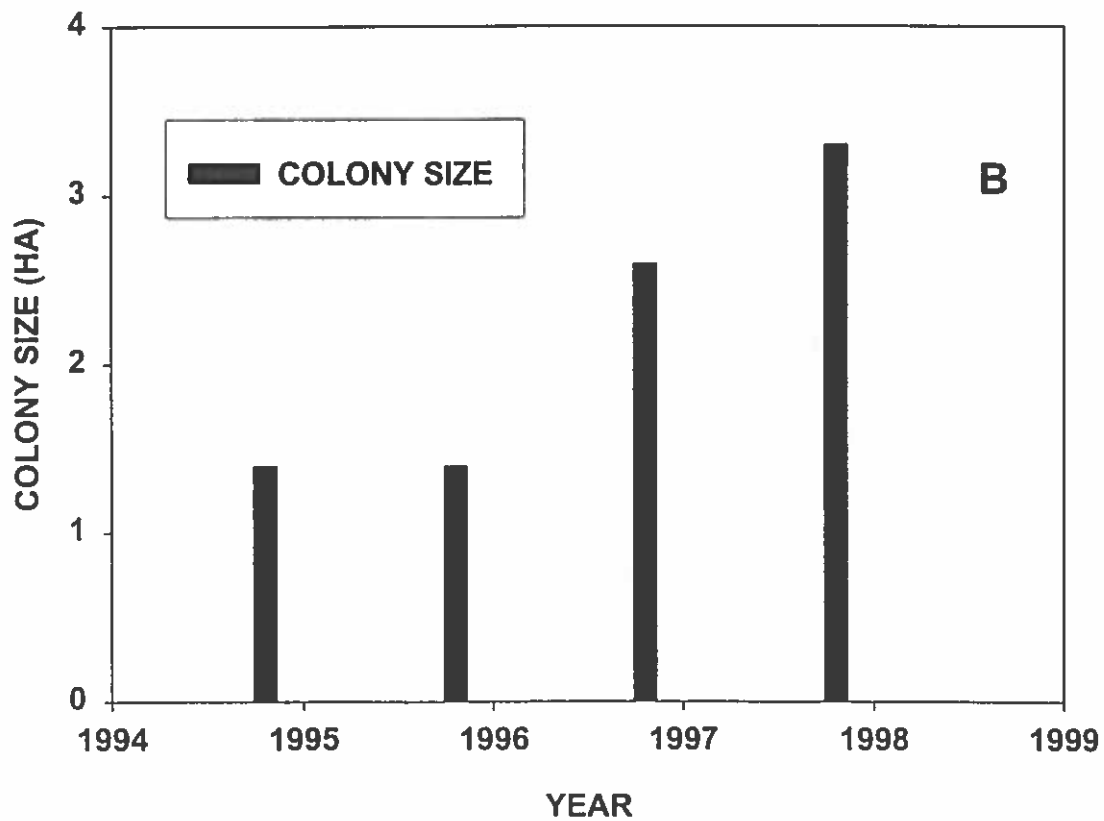
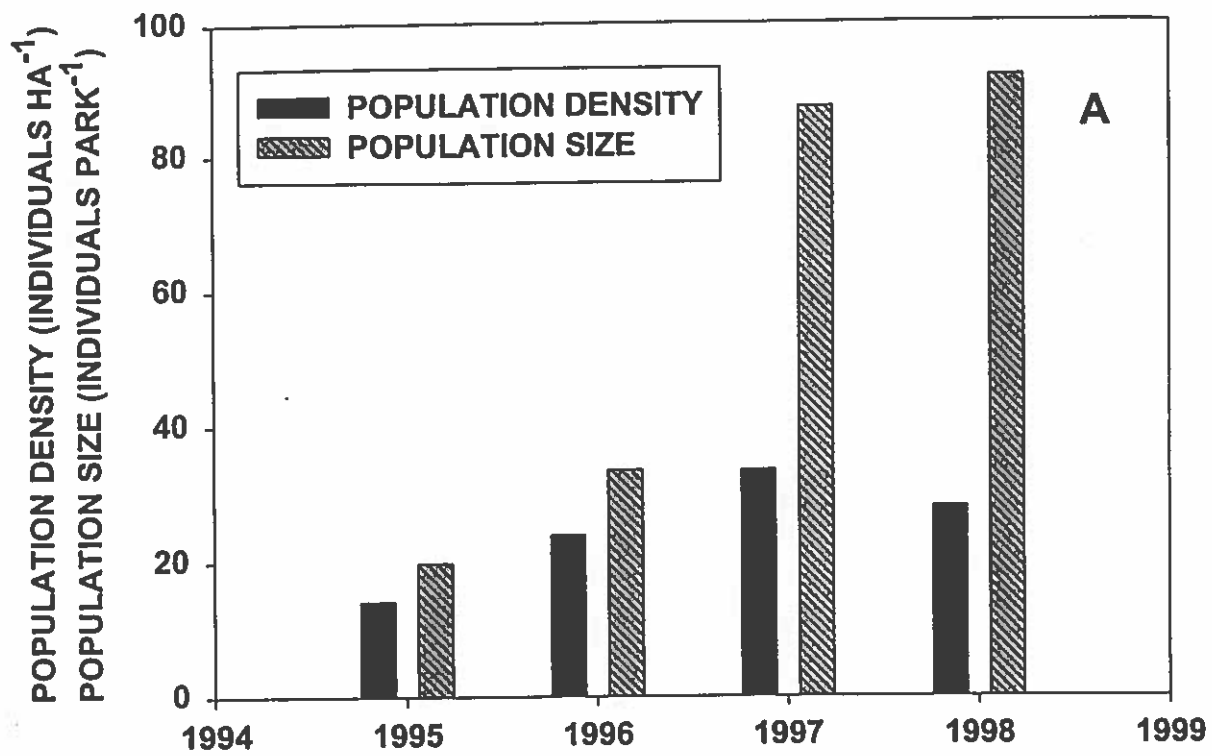


FIGURE 1. DYNAMICS OF BLACK-TAILED PRAIRIE DOGS AT SCOTTS BLUFF NATIONAL MONUMENT. A. POPULATION TRENDS, AND B. COLONY SIZE TRENDS

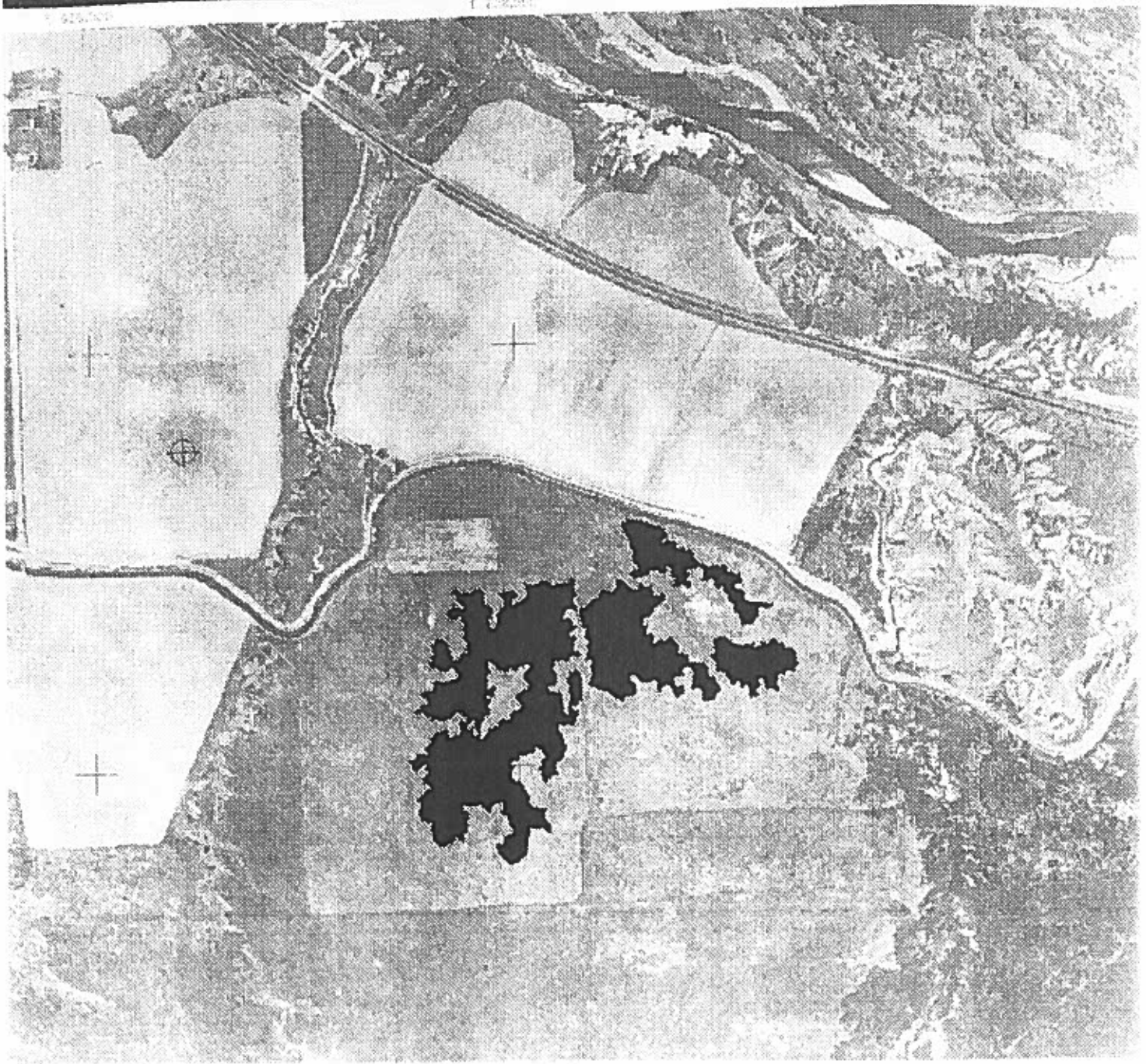


FIGURE 5. MAP OF BLACK-TAILED PRAIRIE DOG COLONY AT SCOTTS BLUFF IN 1990

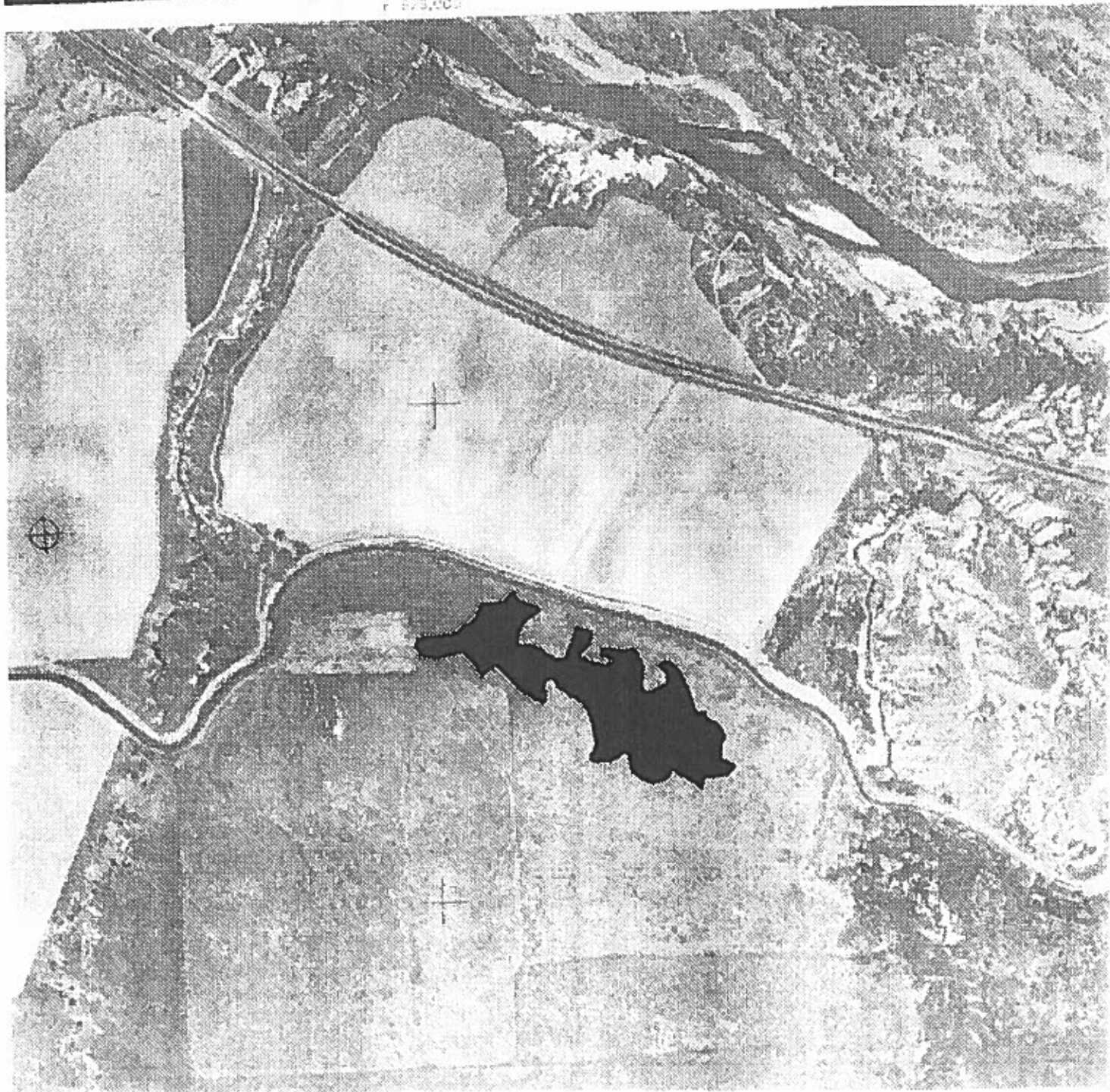


FIGURE 4. MAP OF BLACK-TAILED PRAIRIE DOG COLONY AT SCOTTS BLUFF IN 1998

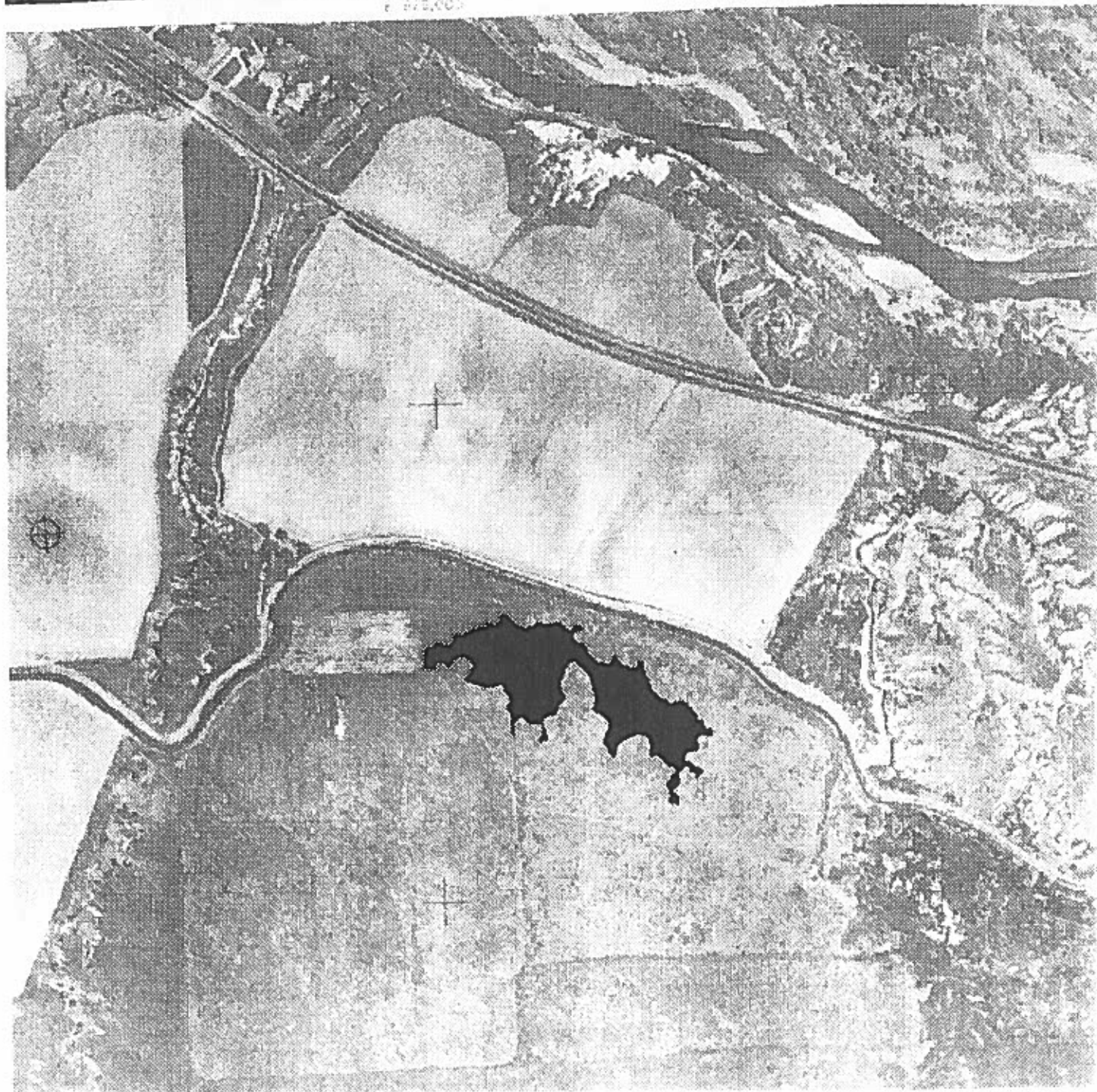


FIGURE 3. MAP OF BLACK-TAILED PRAIRIE DOG COLONY AT SCOTTS BLUFF IN 1997.



FIGURE 2. MAP OF BLACK-TAILED PRAIRIE DOG COLONY AT SCOTTS BLUFF IN 1995