1994 PRAIRIE DOG BURROW MAPPING WITH GLOBAL POSITIONING SYSTEMS, UL BEND NATIONAL WILDLIFE REFUGE, PHILLIPS COUNTY, MONTANA

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INTRODUCTION

Holes in the ground are a very important feature of black-footed ferret habitat. The number, distribution, and activity level of prairie dog burrows is related to prairie dog abundance (ferret food) and directly affects/provides escape cover and shelter for ferrets. Habitat attributes, such as burrow distribution, will be important in understanding ferret movements, dispersal, habitat selection, and ultimately reproduction and survival.

A current and accurate map of the prairie dog habitat on which black-footed ferrets would be released in the fall of 1994 was needed. This project attempted to map the location of every prairie dog burrow on the ferret release site.

Global Positioning Systems (GPS) provide a mechanism to accurately map geographical features and import the data into Geographical Information Systems (GIS). GPS and GIS have been used during the last several years to map prairie dog colony boundaries in Southern Phillips County, Montana. The effort described in this chapter used GPS and GIS to produce maps of all prairie dog burrows on the ferret release site and a boundary of the prairie dog colonies by connecting the outer perimeter of burrows.

METHODS

Prairie dog burrows on the main "Locke Ranch prairie dog colony" and the colony immediately south and west were mapped on June 28-30, 1994. These colonies are located in T21N, R29E, S11 and S12.

Four Trimble Navigation, Ltd., Pathfinder Professional GPS receivers, with Corvalis Micro-Technology (CMT), MC-V data loggers were used. GPS units were cooperatively supplied by the National Biological Survey (NBS), Fort Collins, CO, Bureau of Land Management (BLM), Malta, MT, US Fish and Wildlife Service (FWS), Region 6, Denver, CO, and the Charles M. Russell National Wildlife Refuge (CMR), Lewistown, MT. PATHLOG ver. 2.66 was loaded on each data logger. Processing was completed with PFINDER ver. 2.40-07. PC-Arc/Info, ver. 3.4D, was used for map production.

Data dictionaries were created for each data logger to use the "QUICKMARK" feature of PATHLOG to record active and inactive prairie dog burrows. The location of each QUICKMARK (i.e. burrow location) was interpolated from the GPS positions collected 5 seconds pre- and post-recording the burrow. In addition to GPS recording these QUICKMARK features, a continuous "line" of points was recorded, once per second, for the travel path of each burrow mapper.

All GPS data files were differentially corrected using CMR's Trimble Navigation, Ltd. GPS Community Base Station located in Lewistown, MT (47° 03' 05.264" N, 109° 26' 34.419" W, 1251.35 m HAE). This base station used a 6-channel receiver with ver. 2.06 Community Base Station software, and is located about 90 air miles from the ferret release site.

Rover GPS antennas were mounted on two-three foot long poles attached to racks on four-wheel, All-Terrain Vehicles (ATVs). The receivers and data loggers were also secured to each ATV. The data loggers were strapped across the gas tanks to hold them securely in place, make the displays visible, and buttons accessible. Participants included Eric Krubsack (NBS), Sandy VonWedel (NBS), Jerry Godbey (NBS), Dean Biggins - 75 burrows (NBS), and Randy Matchett (CMR).

Portions of a prairie dog colony were identified for particular mapping sessions using drainages, roads, fences, flagging, etc. in a divide and conquer approach. An ATV was ridden to each burrow and positioned so the GPS antenna was above the burrow entrance. The burrow was recorded on the GPS data logger as active or inactive with a QUICKMARK. Presence of any prairie dog scat near the burrow, regardless of age, indicated an active burrow. Total number of burrows and number of active burrows were also recorded on mechanical clicker counters as a backup. The burrow was then visually marked with a squirt of flour from a plastic beverage dispenser to prevent re-mapping or skipping burrows. With a little practice, only a few seconds were required per burrow to determine if it had been previously mapped, position the GPS antenna, ascertain activity, record the location, punch the mechanical clickers, and mark the burrow with flour.

RESULTS AND DISCUSSION

Mapped burrows totaled 12,244 over 609 acres and 90% were active. Active burrows averaged 18.2 per acre and total burrow density was about 20 per acre. Relatively little time was spent searching for prairie dog scat during mapping, resulting in what may be a conservative estimate of activity. Great differences in burrow density (habitat quality) across the colony were readily apparent (Figure 1). The low density of burrows in the center of the town was expected. The magnitude of higher burrow density in

other areas was not expected, especially given that 1994 was an incredibly lush yellow-sweet clover growth year.

Much of the colony perimeter was surrounded with lush clover. Mappers expected not to find many burrows in and near the clover, especially on the southern edge of the colony, yet some of the highest burrow densities were found there. Prairie dogs appeared to be having trouble keeping up with "logging" the clover in some areas.

Black-footed ferret release cage placement was based on this burrow map with sites spread across the colony and clustered in areas of higher burrow density. Ferret locations will be plotted on this map in an effort to understand what role habitat (i.e. burrow location and distribution) may have on ferret success. Burrows on this area may be re-mapped in the future to assess changes in burrow location and distribution, and prairie dog colony dynamics.

The total number of burrows mapped is a minimum. With the flour marking technique, very little if any double mapping occurred, yet some burrows were missed. Figure 2 shows the coverage intensity from ATVs during the search for burrows. It is unknown how many burrows were missed, but perhaps 10% is a reasonable guess.

In an effort to assess repeatability and mapping completeness, two observers mapped burrows independently in the same sample test area, i.e. within the fence surrounding the ferret camp at the old Locke Ranch site. Observer A mapped all burrows and used flour as a marker (Figure 3). Observer B mapped all burrows after observer A was done and used colored chalk dust as a burrow marker (Figure 4). Figure 5 shows results of both mappers on the same plot.

Observer A mapped 473 burrows and Observer B mapped 435 burrows, a difference of 8.7%. Conversations between observers, and post-mapping reconnaissance, revealed burrows missed by Observer A and mapped by Observer B, burrows mapped by Observer A and missed by Observer B, and even a few burrows missed by both observers. Nonetheless, both burrow maps (Figure 3 and 4) show essentially the same picture of burrow location and distribution.

Given the area and magnitude of the project, the intended uses, and the fact such data has never before been available, such variances were deemed acceptable. Time allotted to this mapping project was extremely limited. Better mapping completeness would likely result if more time was available (perhaps four or five days instead of three).

Observer bias in classifying burrow activity was thought to be nil. Throughout the mapping effort, periodic comparisons of

proportion of active burrows were made among all observers. Activity proportions were remarkably similar, with variances being easily attributable to the portion of the town being mapped (e.g. mapping an area prone to flooding had higher proportions of inactive burrows).

Locational accuracy is another source of error in addition to burrow finding and classifying problems. Locational accuracy is thought to be ± five meters or less with the methods we employed. Differential corrections (measurement space method) used a base station less than 100 miles away and QUICKMARK locations were interpolated based on ± 5.0 seconds. Given the type of mapping GPS equipment used, there will be an inherent "float" in the location of points. Nonetheless, an average of around 10 feet of float on a burrow location in a prairie dog colony spread across a square mile is remarkable. More important than the locational accuracy of any given burrow is the relative location and distribution of all burrows, of which these results are very useful.

The overall average burrow mapping speed was about 175 burrows per hour. This included locating a burrow, determining if it had been previously mapped, classifying activity, positioning the GPS antenna, pushing the correct GPS button, clicking the mechanical counters, and squirting flour in and on the hole, then searching for the next burrow to map. Mapping speed varied depending on observer and burrow density. In areas of high burrow density, a mapping rate of nearly 400 burrows per hour was achieved by some observers.

Flour consumption totaled about 80 pounds to map the 12,244 burrows over 609 acres. Flour was economized on the second day and we eventually ran out. Pre-mixed pancake flour was substituted for plain flour, but it didn't work very well. It was more "caky" than plain flour and clogged the squirt spouts. Roughly 1.5 pounds of flour per 10 acres of prairie dog colony was adequate to map burrows at the burrow densities found at this site.

NOTES AND PROBLEMS ENCOUNTERED

Mosquitoes and biting flies were bothersome at times. Observer motivation was a factor in burrow mapping speed, e.g. mosquito clouds near lush yellow sweet clover patches increased mapping speed.

Keeping GPS batteries charged was a constant struggle as we relied on a portable gas generator for electricity. The few spare batteries we had were invaluable. We have since found a source for cheap replacements and chargers and keep plenty on hand.

With the dirt, dust, and physical pounding, several of the mechanical clickers began to stick and malfunction. Instead of the clickers being the fail safe for electronic screw-ups with the GPS, the GPS proved more reliable. Only two problems (both relatively minor) were encountered with GPS: 1) inadvertent double button punches, especially as the ATV hit a bump, and 2) miscoding burrow activity status by not checking the GPS display as to the type of burrow being recorded (this error was mostly a function of operator fatigue, boredom, and monotony). Both of these type errors were easily corrected with editing based on field notes describing the problem.

Bright sunlight "bleached" the LED displays on the data loggers. Shades were made to protect the LED displays, but had to be flipped up to view the display, thus contributing to a few miscoding errors.

The effort and mechanics of this burrow mapping effort was similar to the prairie dog dusting effort to kill fleas during 1993. Squirting flour to mark the burrow for mapping is virtually identical to depositing permethrin. Four people mapped and dusted with flour over 600 acres of prairie dog colonies in three days. Should dusting be considered in the future, use of GPS and ATVs may greatly speed permethrin application, reduce man-power requirements, and result in burrow maps as a bonus.

Figure 1. Prairie dog burrow map of the 1994 Montana black-footed ferret release site.

Figure 2. Four-wheeler paths showing coverage intensity across the 1994 Montana black-footed ferret release site prairie dog colony during the burrow mapping effort.

Figure 3. Burrow map from Observer A on sample test area.

Figure 4. Burrow map from Observer B on sample test area.

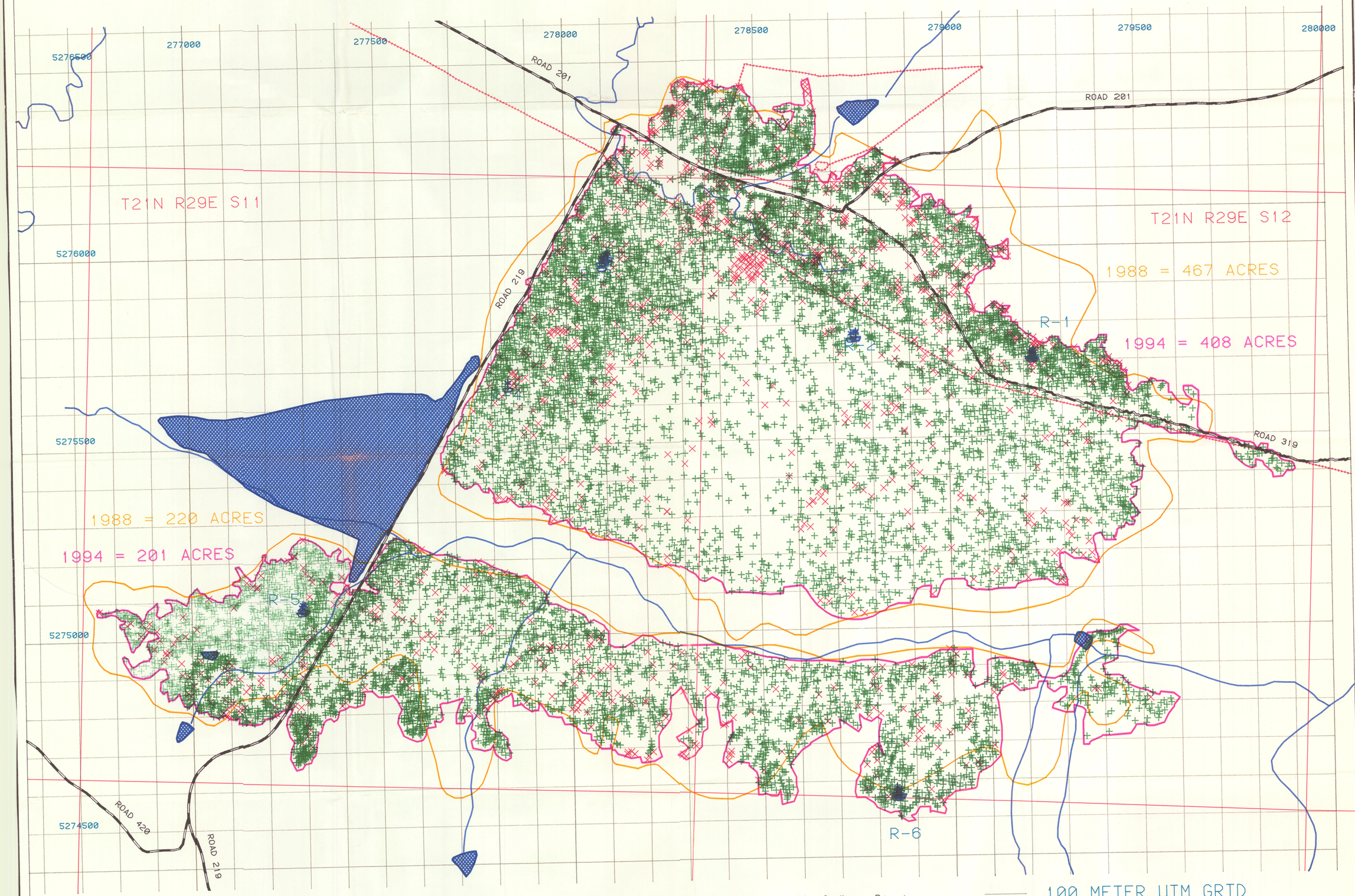
Figure 5. Burrow map from Observers A and B on the sample test area.

Figure 1

PRAIRIE DOG BURROW LOCATIONS ON THE 1994 BLACK-FOOTED FERRET RELEASE SITE, UL BEND NWR, PHILLIPS COUNTY, MONTANA.

N

90% OF 12,244 BURROWS WERE ACTIVE.
ACTIVE BURROWS AVERAGED 18.2 PER ACRE.
TOTAL BURROWS AVERAGED 20.1 PER ACRE.



1988 PDT BOUNDARY - 687 ACRES
1994 PDT BOUNDARY - 609 ACRES
\+ ACTIVE BURROWS - 11,075
× INACTIVE BURROWS - 1,169
☆ OLD LOCKE GARAGE
RELEASE BOXES

Data collected June 28-30, 1994 by Matchett, Godbey, Biggins, Krubsack, and VonWedel from ATVs. Each burrow was classified as active or inactive based on presence of prairie dog scat. Burrows were counted on clickers, visually marked with flour, and locations recorded with GPS.
Map produced by Matchett with PC ARC/INFO from data collected with Trimble Pathfinder GPS equipment.
All GPS files differentially corrected with FWS, Lewistown GPS base station.

100 METER UTM GRID
PLS - SECTION LINES
ROADS
FENCES
STREAMS & RESERVOIRS

SCALE = 1:4300 FILES: PDBWUTM.SML & PDBWANNO REV: 1/8/95

FIGURE 2

ATV BURROW MAPPING TRACKS ON THE 1994 BLACK-FOOTED FERRET RELEASE SITE, UL BEND NWR, PHILLIPS COUNTY, MONTANA

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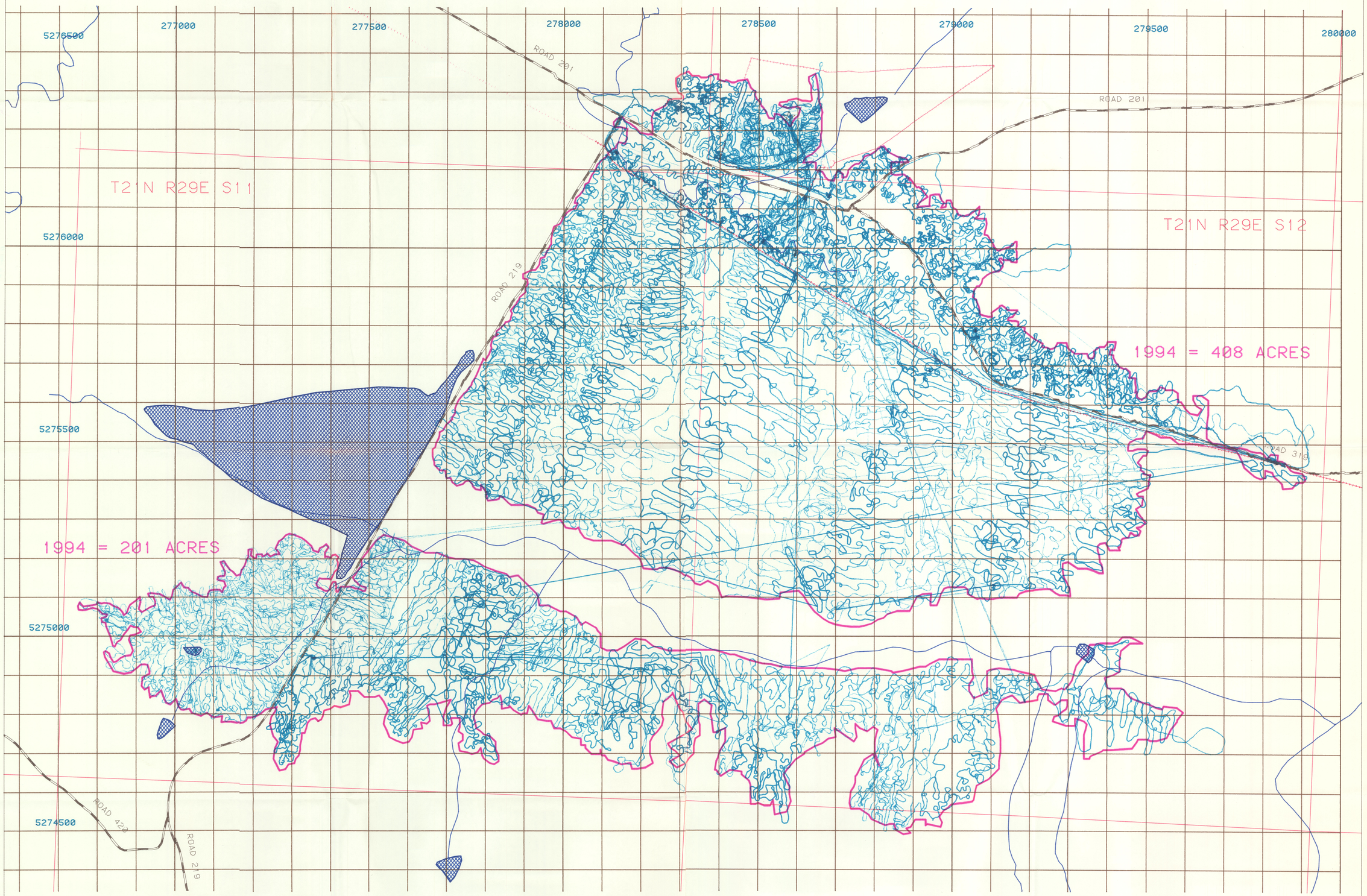
Coverage intensity while searching for prairie dog burrows was adequate, but some burrows were undoubtedly missed. Nonetheless, a good map of 12,244 burrow locations resulted.



ATV PATHS DURING BURROW MAPPING

1994 PDT BOUNDARY - 609 ACRES

☆ OLD LOCKE GARAGE

Data collected June 28-30, 1994 by Matchett, Godbey, Biggins, Krubsack, and VonWedel from ATVs. Each burrow was classified as active or inactive based on presence of prairie dog scat. Burrows were counted on clickers, visually marked with flour, and locations recorded with GPS.
Map produced by Matchett with PC ARC/INFO from data collected with Trimble Pathfinder GPS equipment.
All GPS files differentially corrected with FWS, Lewistown GPS base station.

100 METER UTM GRID

PLS - SECTION LINES

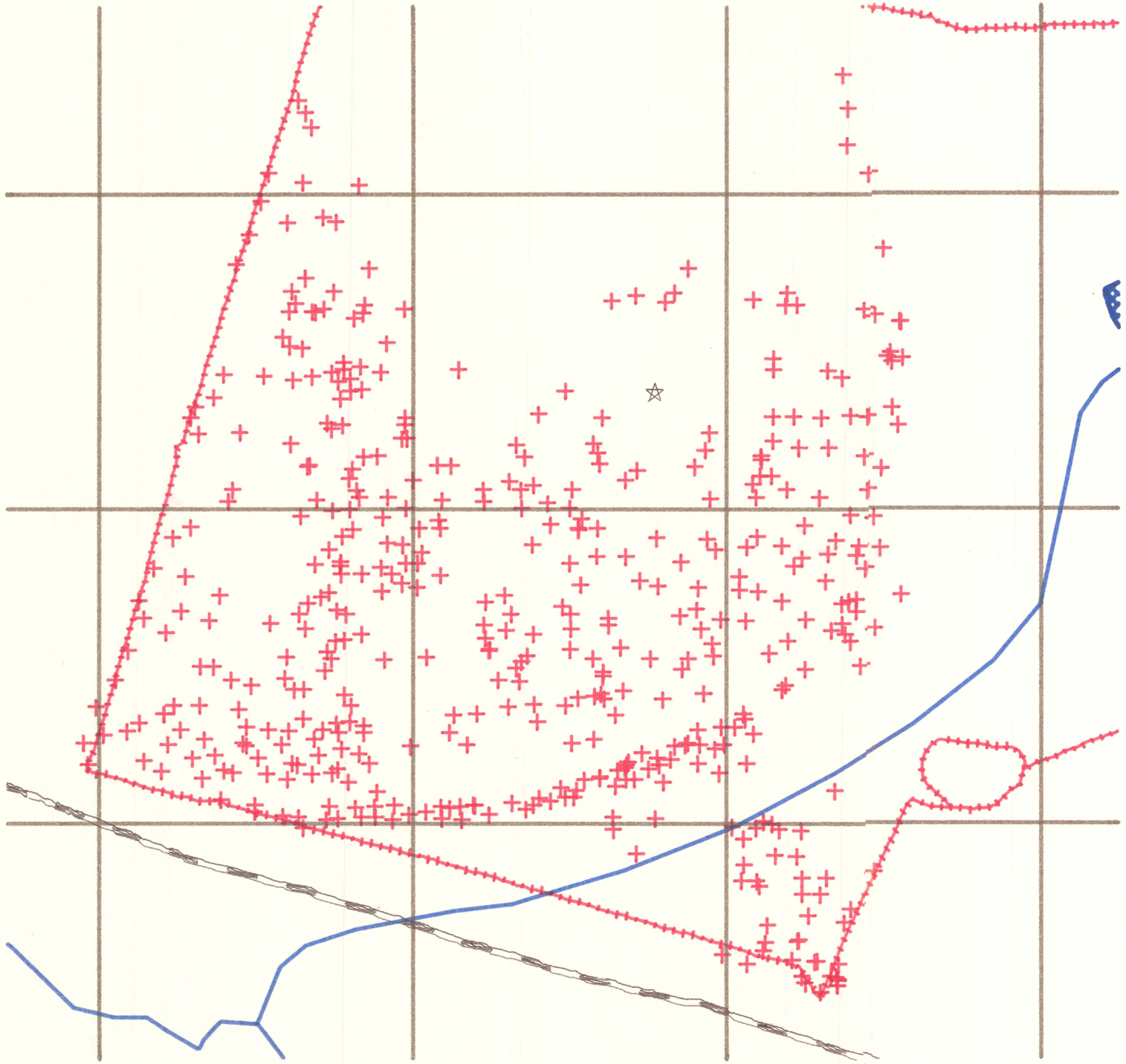
ROADS

FENCES

STREAMS & RESERVOIRS

SCALE = 1:4300 FILES: PDBATV.SML & PDBATVAN REV: 1/10/95

FIGURE 3



REPEATED PRAIRIE DOG BURROW MAPPING RESULTS FROM A SAMPLE TEST AREA ON THE 1994 BLACK-FOOTED FERRET RELEASE SITE, UL BEND NWP, PHILLIPS COUNTY, MONTANA.

Two observers independently mapped burrows within the fence surrounding the ferret camp. Mapping repeatability was hoped to be better, but was still considered adequate. More consistency is achieveable based on experience gained in this effort.

\+ **OBSERVER A - MAPPED 473 BURROWS**

☆ OLD LOCKE GARAGE

100 METER UTM GRID

ROADS

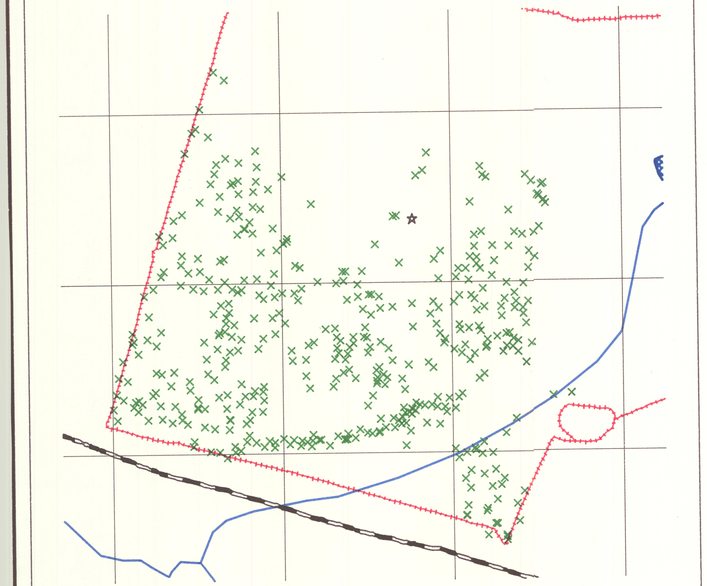
FENCES

STREAMS & RESERVOIRS

Data collected June 30, 1994 by Matchett from an ATV. Map produced by Matchett with PC ARC/INFO from data collected by Trimble Pathfinder GPS equipment. All GPS files were differentially corrected with FWS, Lewistown GPS base station data.

SCALE = 1:1550 REV: 1/8/95

Figure 4



REPEATED PRAIRIE DOG BURROW MAPPING RESULTS FROM A SAMPLE TEST AREA ON THE 1994 BLACK-FOOTED FERRET RELEASE SITE, UL BEND NWR, PHILLIPS COUNTY, MONTANA.

Two observers independently mapped burrows within the fence surrounding the ferret camp. Mapping repeatability was hoped to be better, but was still considered adequate. More consistency is achieveable based on experience gained in this effort.

× OBSERVER B - MAPPED 435 BURROWS

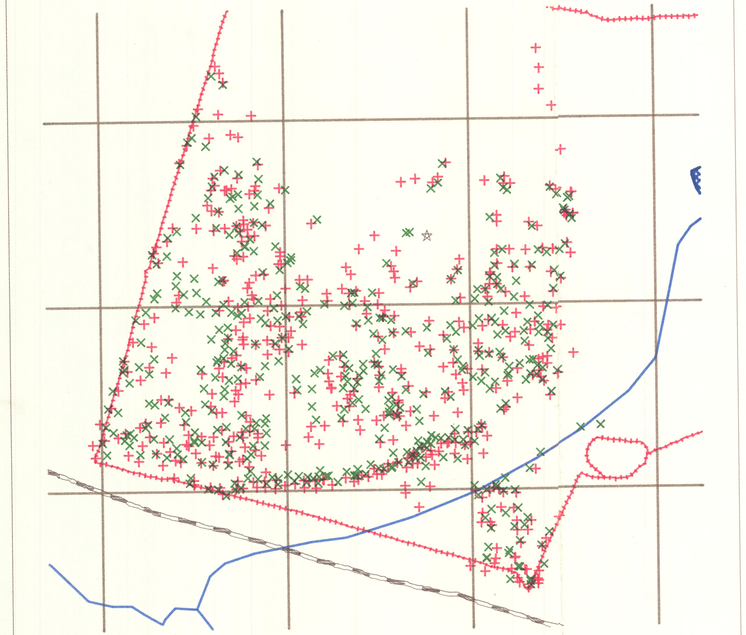
☆ OLD LOCKE GARAGE
100 METER UTM GRID
ROADS
FENCES
STREAMS & RESERVOIRS

Data collected June 30, 1994 by VonWedel from an ATV. Map produced by Matchett with PC ARC/INFO from data collected by Trimble Pathfinder GPS equipment. All GPS files were differentially corrected with FWS, Lewistown GPS base station data.

SCALE = 1:1550

REV: 1/8/95

FIGURE 5



REPLICATED PRAIRIE DOG BURROW MAPPING RESULTS FROM A SAMPLE TEST AREA ON THE 1994 BLACK-FOOTED FERRET RELEASE SITE, UL BEND NWR, PHILLIPS COUNTY, MONTANA.

Observers A and B independently mapped burrows within the fence surrounding the ferret camp. Mapping repeatability was hoped to be better, but was still considered adequate. More consistency is achieveable based on experience gained in this effort.

+ OBSERVER A - MAPPED 473 BURROWS

× OBSERVER B - MAPPED 435 BURROWS

MAPPED BURROW DIFFERENCE OF 8.7%

☆ OLD LOCKE GARAGE

100 METER UTM GRID

ROADS

FENCES

STREAMS & RESERVOIRS

Data collected June 30, 1994 by Matchett and VonWedel from ATVs. Map produced by Matchett with PC ARC/INFO from data collected by Trimble Pathfinder GPS equipment. All GPS files were differentially corrected with FWS, Lewistown GPS base station data.

SCALE = 1:1550

REV: 1/8/95