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THREATS TO COLLARED LIZARDS IN IDAHO

by

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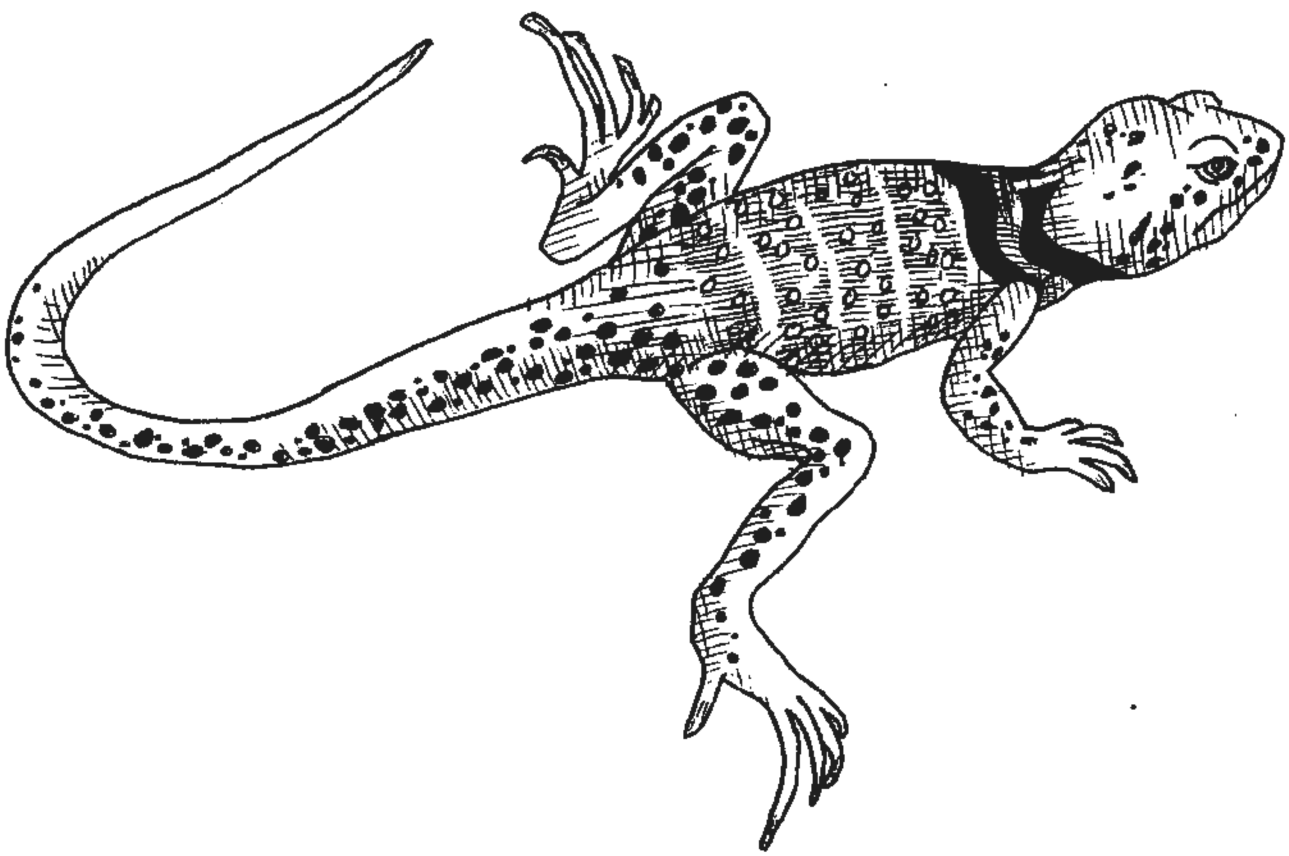

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INTRODUCTION

Throughout their range, Mojave black-collared lizards (*Crotaphytus bicinctores*) occur in arid, rocky habitats. In Idaho, they occur only in southwestern part of the state at the northern extent of their range (Dumas 1957, Linder and Fichter 1977, Nussbaum et al. 1983). Currently in Idaho, Mojave black-collared lizards are found primarily south of the Snake River in Owyhee County, although museum records (Idaho Museum of Natural History) include several locations near the Snake River in Ada, Canyon, and Elmore Counties. With a limited distribution and little known about their biology in Idaho (Nussbaum et al. 1983), Mojave black-collared lizards are considered a sensitive species by the Bureau of Land Management (BLM) and as a species of special concern hy the Idaho Department of Fish and Game. Although Mojave black-collared lizards can be found in arid rocky habitats in general, we do not know what type of rocky habitats they may or may not occur in and why. To effectively manage Mojave black-collared lizards, we must manage the habitat they occupy, which, in turn, requires that land managers be able to identify the habitat or habitats that are important for their survival.

The exact status of Mojave black-collared lizards in Idaho is not known. Gerber et al. (1997) surveyed for lizards in the Big Jacks and Little Jacks Creek drainages of Owyhee County using drift fences. No Mojave black-collared lizards were captured in the drift fences; however, Mojave black-collared lizards were observed during visual searches of the study area (Gerber et al. 1997). Because the Mojave black-collared lizard is not readily surveyed by trap or pitfall methods, it is difficult to determine their relative abundance with these standard-trapping methods.

Because Mojave black-collared lizards tend to be located in specific habitats, they may exist in isolated subpopulations within those habitats. Human activities often intensify patchiness and isolation of subpopulations due to habitat fragmentation (Wiens 1996). As the human population continues to increase in southwestern Idaho, desert resources are likely to sustain greater impacts. Increased activities in habitats occupied by Mojave black-collard lizards may have direct or indirect effects on this lizard species. Direct impacts are immediate, resulting in removal of individuals from a subpopulation. Examples of direct impact include recreational activities (off highway vehicles, shooting, and collection), land development, and natural processes, such as fire. Indirect impacts reduce the long-term viability of populations and are often habitat related. Examples of indirect effects include habitat destruction, alteration (i.e., rock collecting for landscaping), or fragmentation, either natural (fire) or artificial (roads). A management strategy that focuses on the protection of islands of suitable habitat may only provide a short-term solution, because subpopulations may be subject to eventual extinction. Therefore, in addition to being able to predict the presence of Mojave black-collared lizards within specific habitat types, it will be important to understand the spatial relationship of these habitats and how the arrangements of habitats may relate to Mojave black-collared lizards subpopulations.

In the present study, habitat associated with Mojave black-collared lizard locations is being examined at three scales: the landscape (macrohabitat), habitat (mesohabitat), and microhabitat. Data collected at the macrohabitat scale is composed entirely of Geographical Information System (GIS) data. Data at the mesohabitat and microhabitat scales are collected in the field. Using these habitat layers, we will construct a habitat model to predict habitat important to the Mojave black-collared lizard. This document will report the results from the first year of study.

STUDY AREA

The study area covers 504 square miles (14 townships) south of the Snake River in Owyhee County, Idaho (Figure 1). The study area is is located in the Owyhee foothills and the Snake River Plain rising nearly 4,000 feet in elevation from 2,200 feet at the Snake River to nearly 6,000 feet near Toy Mountain. Further to the southwest, the Owyhee Mountains rise to over 8,000 feet in elevation. Runoff from winter snowpack in the Owyhee's has helped shape this area, creating a landscape composed of a mosaic of stream channels and basalt buttes rising above the plain. Ephemeral washes are common in the study area although precipitation averages only about 10 inches annually, most of which comes during the winter. Occasionally, strong thunderstorms occur during the hot summer months. Mojave black-collared lizards are commonly associated with rocky outcrops near Fossil Butte, Reynolds Creek, Antelope Springs, and around Murphy, Idaho within the study area. Most of the land is public and is administered by the BLM, Owyhee Resource Area.

SPECIES INFORMATION

Mojave black-collared lizards are relatively large and colorful lizards that are easily recognized by a conspicuous pair of black bands or collars surrounding the neck separated by a white one (Nussbaum et al. 1983). Males are larger and more brightly colored than females reaching 109 mm (4.3 in) snout vent length (svl) and 330 mm (13 in) in total length (Storm and Leonard 1995). The tail is long and laterally compressed. The body color consists of lateral bands varying in color from tan to reddish-brown that are often covered with white dots (particularly in males). Breeding takes place in the spring as males perch on rocks displaying their colors. Little is known about reproduction in *C. bicinctores* in southern Idaho. In the northern latitudes of Idaho, it is believed that only one clutch is laid. However, in more southern parts of their range, they are capable of laying two clutches of 3 to 8 eggs, the last of which will hatch in late summer (Nussbaum et al. 1983). Throughout their range, all but one species of collard lizard (*Crotaphytus reticularis*) are restricted to rocky habitats (Pough et al. 1998). The primary diet of individuals in Oregon was insects, particularly orthopterans and lepidopterans (Whitaker and Masser 1981), but they also consume vertebrates, such as other lizards (Pough et al. 1998).

Members of the genus *Crotaphytus* occur in arid habitats from southwestern Idaho, south into northern Mexico and eastward to Missouri, Arkansas, and Louisiana (McGuire 1996). There are approximately nine species of collared lizards in North America (Pough et al. 1998). The Mojave black-collared lizard (*Crotaphytus bicinctores*) is distributed throughout much of the southwest and intermountain northwest (Figure 1). The systematics of *C. bicinctores* has been controversial. The species was first described by Smith and Tanner (1972) as a subspecies of *C. collaris* (*C. c. bicinctores*) while Axtell (1972) considered *C. c. bicinctores* to be a subspecies of *C. insularis*. Montanucci et al. (1975) supported Axtell's (1972) classification, using cladistic analysis. However, Sanborn and Loomis (1979) suggested that this species be considered a separate species, *C. bicinctores*. Montanucci (1983) refuted Sandborn and Loomis' (1979) classification and suggested again, his earlier classification of *C. i. bincinctories*. However, Nussbaum et al. (1983) and Storm and Leonard (1995), use Sandborn and Loomis' (1979) classification of *C. bincinctores* while Stebbins (1985) refers to this species as the Great Basin collared lizard (*C. collaris bicinctores*). McGuire (1996) recognized *C. bincinctores* as a distinct species. In addition to species level discrepancies, systematics at the family level have been unstable as well. Until recently, members of the genus Crotaphytidae were in the family Iguanidae, however, they along with members of the genus Gambelia are the only two genera which comprise the family Crotaphytidae (Pough et al. 1998).

METHODS

Lizard Surveys

From 1993 to 1997, BLM personnel identified 39 historic Mojave black-collared lizard locations. Based on the distribution of these historical sites, we delineated a study area that included 35 locations and was logistically manageable. To survey for lizards, each township (sample block) was divided into 1/4 sections; these 1/4 sections were further divided into 1/4 corners (sample units) within the study area (Figure 2). The study units represent the sample units within the study area from which searches for Mojave black-collared lizards would be conducted. From the original 35 historical observations, 25 were determined to be accurate to the study unit (1/4 corner). These 25 historical sites and 6 of 10 randomly selected sample units within the study area were surveyed for Mojave black-collared lizard presence (Figure 3). Sites where Mojave black-collared lizards were found would subsequently be sampled to collect habitat data at that site.

Using line transects; each sample unit was surveyed for lizards. We used 7.5-minute USGS quadrangle maps to locate one comer of the sample unit to be surveyed. Once identified, a coin flip determined if transects in that study unit were walked N-S or E-W. A compass was used to follow the cardinal direction. Each sample unit contained four- 400 m transects (Figure 2). Transects were systematically searched for reptiles by walking and scanning from side to side to detect lizards. Observers monitored transect length by counting paces as each transect was surveyed. For each line transect, the end points (start and end) were mapped with a Trimble GEO Explorerâ Global Positioning System (GPS) unit. Reptile species observed along the line transect were recorded and their perpendicular distance from the line was estimated. Mojave black-collared lizards locations were recorded with the GPS unit and the site was marked with a small 12-inch blue flag for subsequent vegetation sampling. Once all four transects were surveyed, the sample unit was subjectively searched for Mojave black-collared lizards based on the observers perception of "good habitat". These incidental locations were mapped with a GPS unit and marked with a flag for subsequent vegetation analysis as well.

Habitat Surveys

Macrohabitat: Mojave Black-collared lizard locations will be analyzed using GIS techniques at the macrohabitat (landscape) level. According to Manly et al. (1993), there are a number of approaches that may be used to model resource selection: 1) In the first model, locations of individuals within a population are determined with in a defined study boundary. 2) In the second, individuals are marked and located throughout the survey area. 3) In the third design, individuals are marked and followed through time to define the extent of area utilized by the individual. For the macrohabitat portion of this study, we will use study design I to locate individuals within the defined study area.

Lizard locations mapped with GPS will form the basis for GIS analysis. Mojave black-collared lizard sites will be intersected with a variety of landscape variables to determine what combination of variables will correlate best with the known locations. Landscape variables to be examined will include vegetation, soils, roads, hydrography, geology, slope, aspect, and elevation.

If a poor relationship exists between data collected on the ground and the current habitat variables, we will consider creating a supervised classification of a satellite image for the study area. Vegetation data collected on the study area will be used to "calibrate" the map from the known habitats. This method would provide the best predictive model for Mojave black-collared lizard habitat. However, results from such a landscape analysis could not be extrapolated to areas outside the study area. Regardless, data collected at the mesohabitat and microhabitat level will help us understand habitat relationships for the Mojave black-collared lizard.

Mesohabitat: Vegetation data will be collected at all Mojave black-collared lizard locations and at 100 random sites within the study area. Data collected at all sample sites includes habitat components to describe the mesohabitat (Figure 4). Shrub species and ground cover are measured with a 20 m line centered on the sample point and placed at a random angle. Shrub species and ground cover intersecting the line are recorded to the nearest 5 cm. From these values, percent cover estimates will be determined for shruhs and ground cover variables. Ground cover variables include: litter, grasses, forbs, and rock. Rock, as ground cover, is split into six categories; 1) bare ground, 2) gravel, 3) cobble, 4) melon, 5) boulder, and 6) bedrock as shown in Table 1. A variable width belt transect is used to estimate shruh density and rocks. For shrubs, the minimum belt width is the minimum width containing 10 shrubs. For rock, the minimum belt width will he that distance that includes 10 melon sized rocks. For each, the maximum width will be 10 m (5 m a side) for the entire length of the line. Habitat data collected will be analyzed using standard univariate and multivariate statistics to give a quantitative description of the mesohabitat associated with the Mojave black-collared lizard.

Table 1. Classification of rock into 6 size categories measured at sample sites.

	Category Diameter	
Rock Category	Quantitative	Qualitative
Bare	< 1 cm	sand; soil – marble
Gravel	1 - 5 cm	marble - golfball
Cobble	5 - 15 cm	golf ball - softball
Melon	15 - 50 cm	softball - large watermelon
Boulder	> 50 cm	large watermelon; talus -Volkswagen bug
Bedrock	N/A	parent material, imbedded

Microhabitat: Microhabitat is characterized using a 1 m^2 frame centered over the sample site (Figure 4). Within the frame, we record percent cover for vegetation, ground cover, and rock by category (Table 1). Shrubs are recorded to species; forbs and grasses are not differentiated to species. The diameter of the largest rock within the plot is measured by taking 1/2 of the estimated circumference. Escape cover within each plot is determined by counting the number of suitable crevices and vegetative cover sites. From the sample point, distance to the nearest escape cover for both rocks and vegetation within 5 m of the sample site, is recorded as well. Suitable cover is considered to be any cover sufficient to keep a lizard safe from most mammalian or avian predators. As with the mesohabitat data, data at the microhabitat level will be analyzed using univariate and multivariate statistics to provide a quantitative description of microhabitat associated with the Mojave black-collared lizard.

PRELIMINARY RESULTS FROM THE 1998 FIELD SEASON

Lizard Surveys

In 1998, we focused on locating and searching the sample units to find Mojave bBlack-collared lizards and map locations using GPS (Figure 5). Within the study area, we conducted surveys in 31 sample units using 400 m long line transects. Of the 31 sample units, 6 were randomly located within the study area. In total, 124 transects (49,600 m) were surveyed. All GPS points collected have been differentially corrected and entered into a GIS database (ArcView®). Base layers of GIS maps used in the model have been projected into the Idaho Transverse Mercator coordinate system and are stored as shapefiles (ArcView®).

A total of 70 reptiles were recorded from surveys conducted in 11 of the 14 sample blocks (4, 7 and 8 were not surveyed) making up the study area. Six species of lizards (Table 2) and one species of snake were observed while conducting the line transect surveys. The three most abundant species were side-blotched lizard (*Uta stansburiana*) (n=20), Mojave black-collared lizard (n=16), and the western fence lizard (*Scelpororus occidentalis*) (n=14). The only species of snake observed on any transect was the gopher snake (*Pituophis catenifer).* The average number of lizards found per transect at the 25 historical sites was 0.63, on the six randomly located sample units it was 0.125 lizards per transect. On 14 (44%) of the transects surveyed, no lizards (or snakes) were observed. In the six random sample units, only the side-blotched lizard was found (n=3). Only 16 Mojave black-collared lizards were located on the 124 transects surveyed, a much larger number were located incidentally (n=69). It does not appear that using transects is a very effective method of locating lizards, even when searching areas where they have been found historically. Rather, searching in rocky habitats, often near washes, turns up more Mojave black-collared lizards than randomly searching or searching transects. Unfortunately, effort for each of the two methods was not monitored so we are unable to make a valid comparison.

Table 2. Lizard species observed from transects in the study area 1998.

Species	Number	Block(s) observed in
Uta stansburiana	20	5, 10, 12, 13
Croptaphytus bicinctores	16	2, 5, 9, 11, 12
Scelpororus occidentalis	14	2, 12
Cnemidophoris tigris	9	2, 9, 11, 12
Sceloporous graceosus	4	10, 12
Phyrnosoma platyrhynos	1	15
Unknown lizard	2	9,11

Currently, 85 Mojave black-collared lizard locations have been located using a GPS. Because these locations are biased to known Mojave black-collared lizard sites, additional sites will be selected using a stratified random design.

Vegetation surveys

Presently, vegetation data have been collected at 10 sites; no analysis has been conducted. The 1999 field season will be spent collecting vegetation data at lizard locations and sample points. To obtain adequate and representative sample of the entire study area, we propose to sample an additional 100 points within habitats already delineated within the study area. Points will be placed proportional to habitats present in the 1998 GAP model for the Intermountain Region of the western United States within the study area.

METHODS FOR THE 1999 FIELD SEASON

1. We will complete the gathering of habitat data at sites identified during the summer of 1998. Analysis will be completed, allowing for identification of specific habitat needs (e.g., rock densities) of collared lizards.

2. From the above-mentioned GIS model, we will generate points at which collared lizards are predicted to occur. We will then test the model by visiting those points as well as randomly generated points and surveying the points for collared lizards. If the model does a good job of predicting the presence of collared lizards, this would indicate that we have a solid understanding of the habitat requirements of collared lizards.

3. We will begin the construction of a more elaborate GIS model that has as layers various spectra from satellite images. The model will then be tested to determine which spectra, if any, correspond to the presence of collared lizards.

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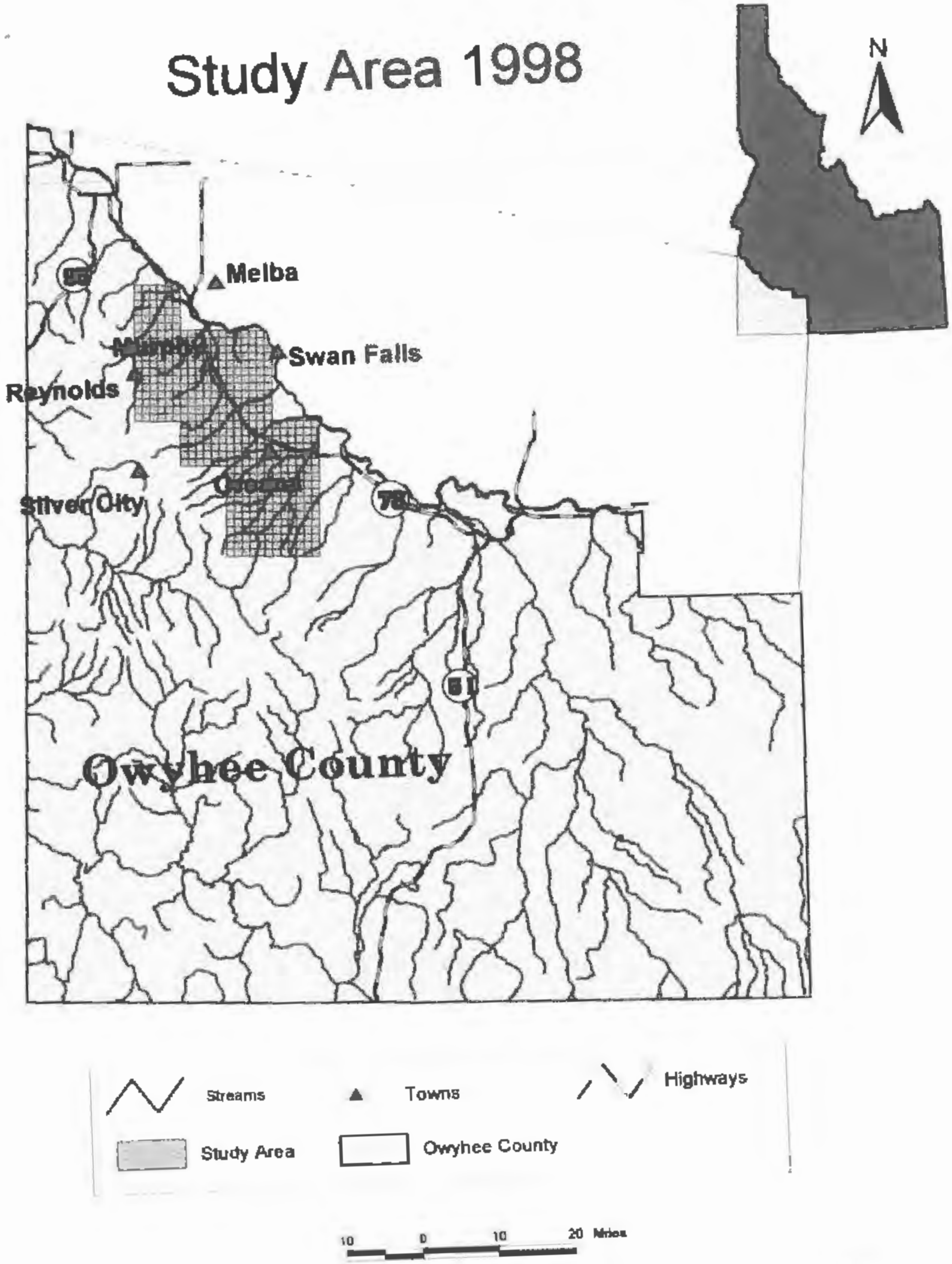

Figure 1. Mojave Black-collared Lizard Study Area, 1998.

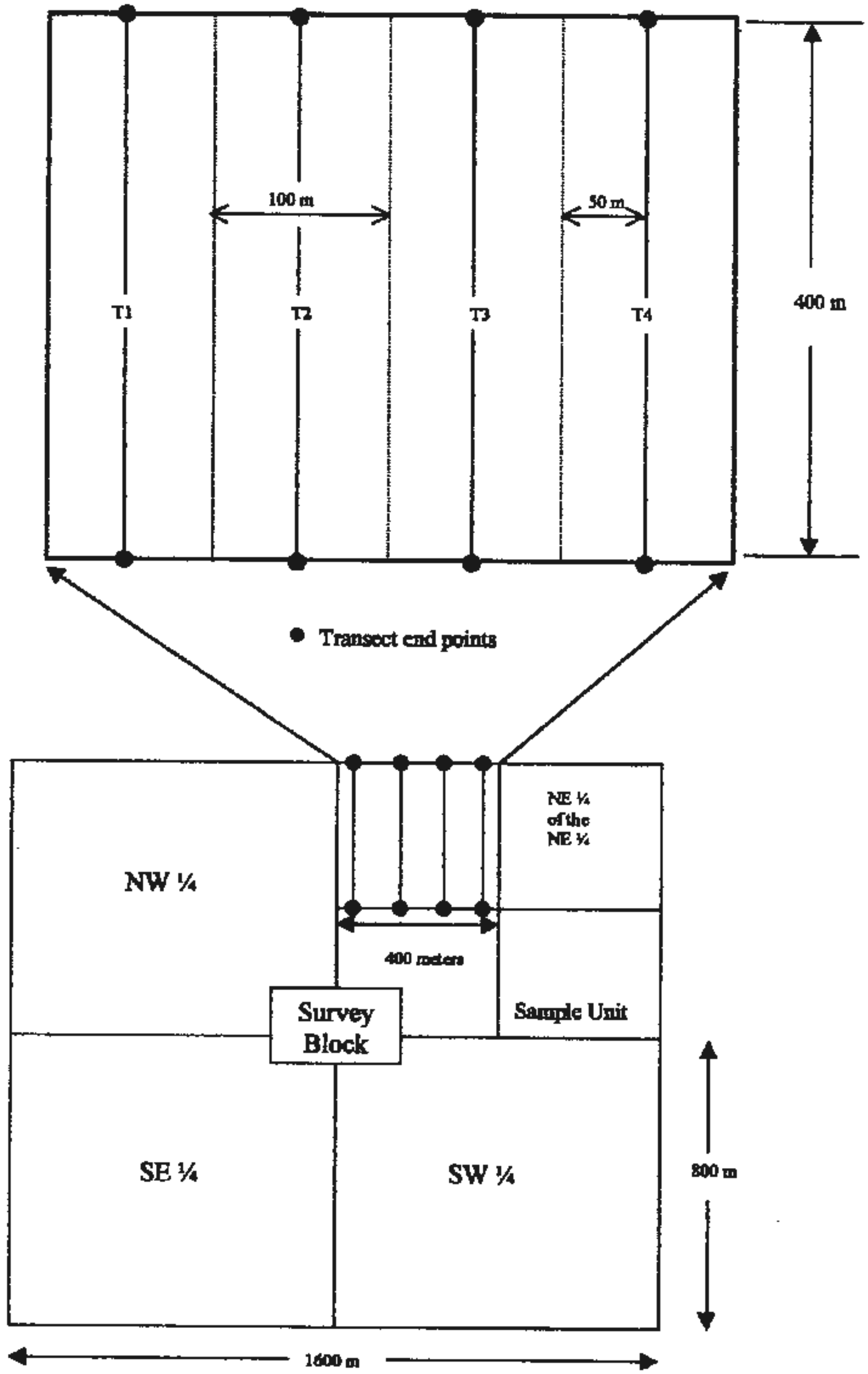

Figure 2. Division of a Sample Block (Section) into Sample Units (¼ corner) and placement of transects (T1-T4) within a sample unit.

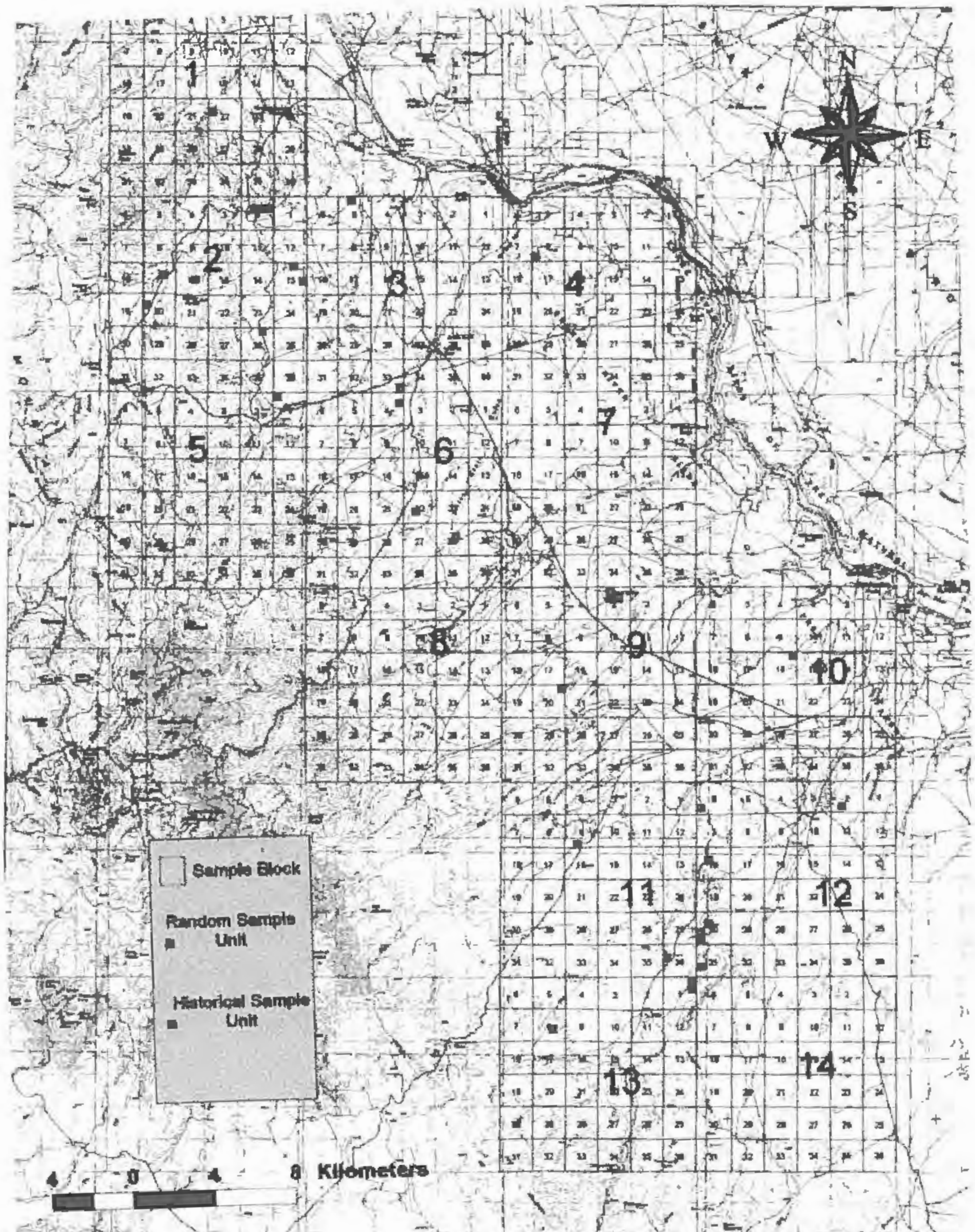

Figure 3. Location of sample units within the study area.

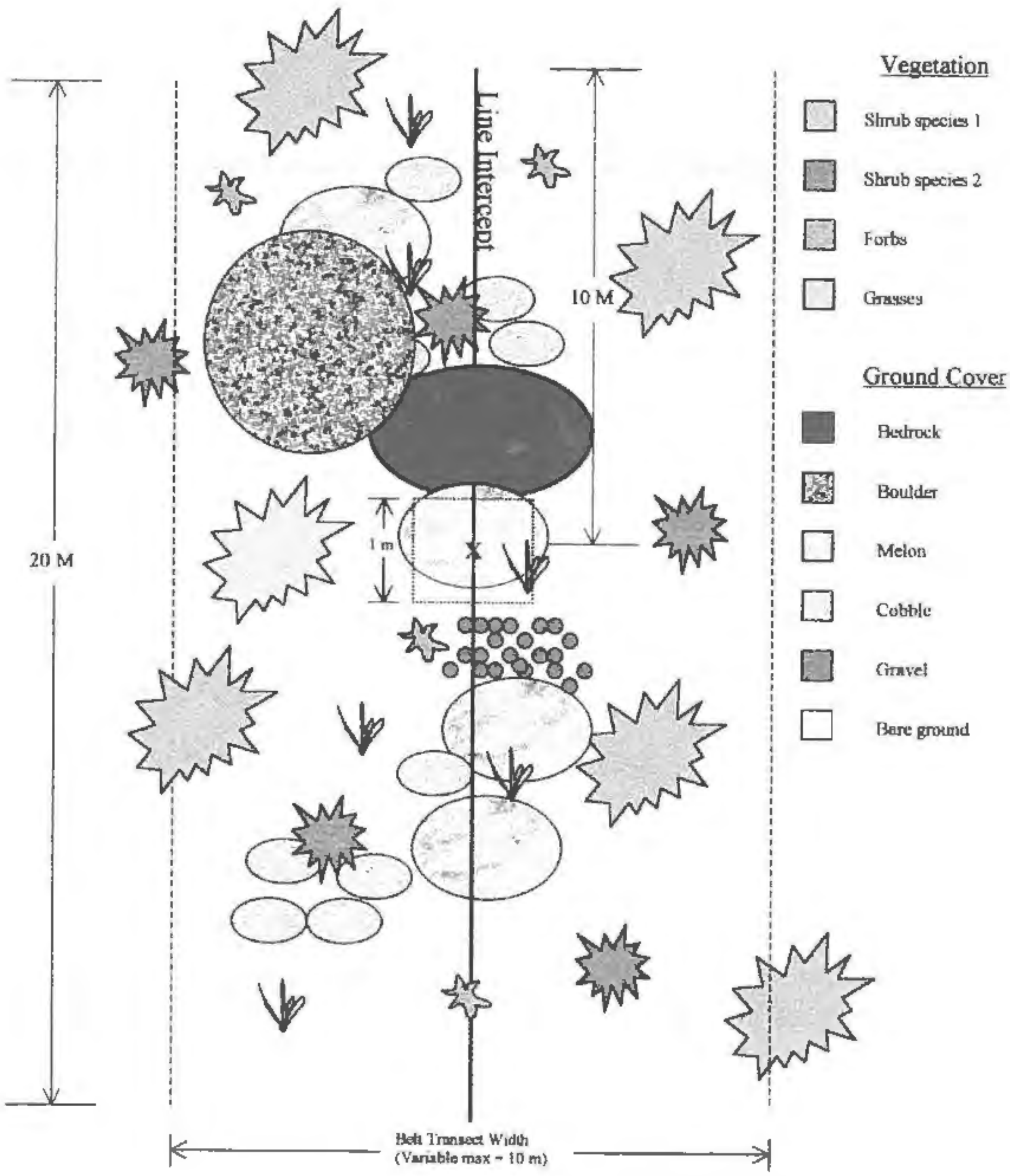

Figure 4. Schematic of vegetation sampling point, illustrating different vegetation and substrates measured at the site. X = sample site, a lizard location, transect end point, or random point.

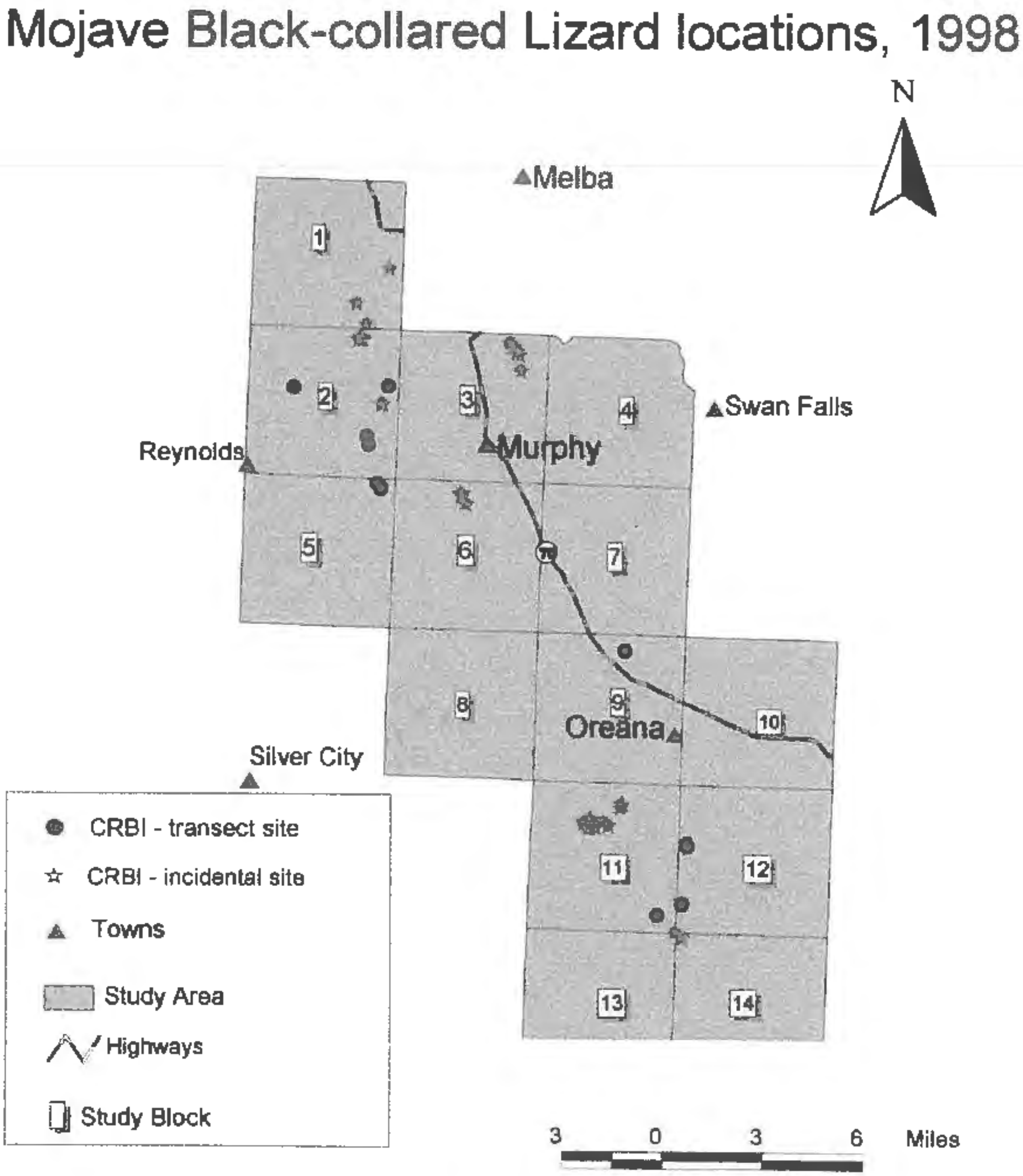

Figure 5. Incidental and transect GPS locations of Mojave Black-collared Lizards, 1998.

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