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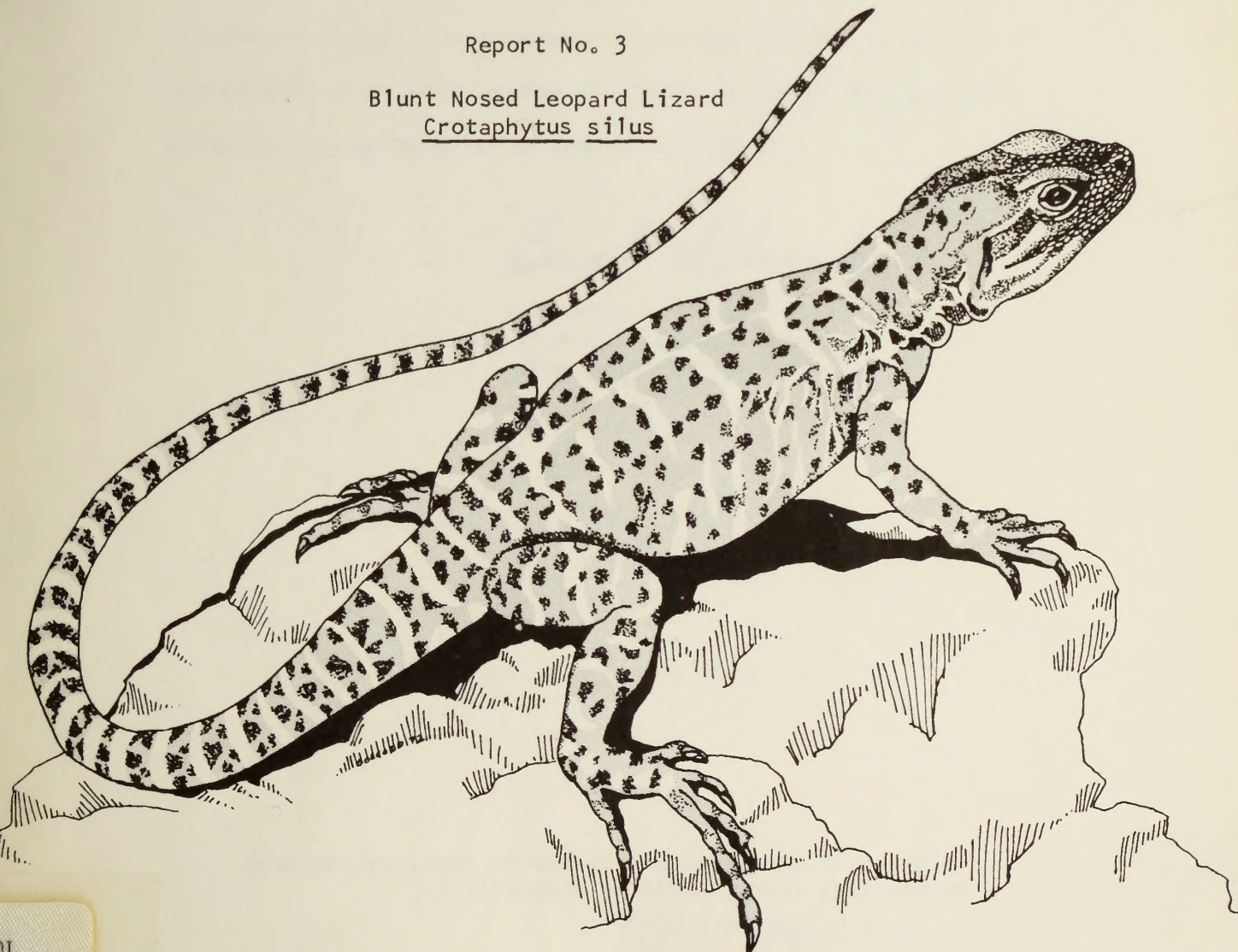
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HABITAT MANAGEMENT SERIES FOR ENDANGERED SPECIES

by Carol Snow, Research Biologist
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Report No. 3

Blunt Nosed Leopard Lizard
Crotaphytus silus



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FORWARD

This Technical Note series on wildlife is designed to provide a literature review and summary of current knowledge pertaining to endangered and other wildlife species occurring on public lands. We in the Bureau of Land Management have recognized the need for basic wildlife information in order to do an effective job in land-use planning. Sound planning must identify the negative aspects as well as the positive benefits of any proposed land management decision or program. It is our hope, too, that this series will also prove useful to others--be they land managers, students, researchers or interested citizens.

Burt Silcock

Director
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Introduction

The objective of this report is to provide BLM personnel with the latest and most up-to-date information on rare or endangered species occurring on the public domain. This will provide a tool for improved understanding of the inter-relationships between the species and its environment and encourage an end product of enlightened land management which will fully consider the species' welfare in all management decisions.

1. Species Description

Crotaphytus silus varies in length from 3½ to 5 inches, snout to vent. The tail is long and round. The head is large with a blunt snout and is distinct from the neck. Coloration above is light to dark gray with large dusky spots (largest on the back) and whitish crossbars which may meet or alternate or both at the midline. Below, the coloration is whitish to yellow with dusky spots on the throat. Montanucci (1965, 1967, 1970) feels that there are definite distinctions between the valley floor and foothills populations of C. silus; foothills lizards are slightly longer, yellowish rather than grayish, have a uniform or faintly marked head and forelimbs rather than marbled and spotted forelimbs, narrower and straighter transverse bands, yellow or cream bands (very seldom white, whereas valley lizards frequently have white bands), and smaller dorsal spots. The red juvenile color is confined to neat circular spots rather than spreading outside the spots. The breeding color of the males is salmon or salmon pink in the foothills population, while a rusty color predominates in valley males. (Montanucci, 1965, 1967, 1970, 1972b; Stebbins, 1954; Cal. Dept. of Fish and Game, 1972; USDI, 1968).

Montanucci (1970) recognizes Crotaphytus silus as a distinct species from Crotaphytus wislizenii on the basis of morphological differences, color pattern, cranial osteology, serology, and behavior. The distributions of C. silus and C. wislizenii do not overlap, except in Ventura County, California. Species identification in this area is complicated by the presence of hybrids. One of the most obvious differences between C. silus and C. wislizenii is that C. silus has a truncate snout and a broad, triangular head compared to wislizenii. The gular area in C. silus is typically spotted, whereas the gular pattern in C. wislizenii typically consists of parallel streaks (see Fig. 1). Differences have also been observed in head-bobbing

Figure 1

Blunt Nosed Leopard Lizard



C. silas



C. wislizenii

Typical gular pattern in leopard lizards.



Blunt Nosed Leopard Lizard
Crotaphytus silas

(Photograph courtesy of Richard Montanucci)

behavior. In C. silus, only the head and neck move when it bobs its head, and it completes this motion within two seconds. In C. wislizenii, the chest is also lifted during the head bob. It takes C. wislizenii four to eight seconds to complete this movement (Montanucci, 1970).

2. Distribution, Present and Former

The blunt nosed leopard lizard was originally found in the San Joaquin Valley and adjacent foothills from about San Joaquin County southward and into San Luis Obispo County. It is now found in scattered locations in San Joaquin Valley, in the foothills of Tulare and Kern Counties and up the eastern portions of the Coast Range foothills; Fresno, Kern, Madera, Merced, San Luis Obispo and Tulare Counties. (Stebbins, 1954; BSFW, 1968; Cal. Dept. of Fish and Game, 1972).

Montanucci (1965) listed specific areas where he knew these lizards and/or suitable habitat were located in 1965:
Merced County - 3 to 10 mi. N Los Banos; 6 to 14 mi. E Merced; 8 mi. S Merced; 6 mi. SE Merced; 5 mi. W El Nido; 9 mi. NE Dos Palos; Madera County - 6 to 13 mi. E Firebaugh; 12 mi. W Madera; 5 to 17 mi. E Madera; 3 to 6 mi. W Friant; San Benito County - Panoche Valley; Fresno County - Panoche Plain, 20 mi. S Dos Palos; Valley of Little Panoche, 22 mi. SW Dos Palos; 5 to 14 mi. SE Mendota; 15 to 20 mi. S Mendota; 2 to 7 mi. N Tranquillity; Pleasant Valley, near Coalinga; Tulare County - 5 mi. S Kingsburgh; Kings County - Kettleman Plain, 5 mi. N to 8 mi. S Avenal; 3 to 7 mi. S Kettleman City; Kern County - Antelope Plain, near Orchard Peak; Lost Hills; Blackwells Corner; Devils Den; 8 mi. W Wasco; 5 mi. E Bakersfield; 10 to 20 mi. S Bakersfield; 7 to 15 mi. E Maricopa; 3 to 10 mi. W Buttonwillow; 15 to 25 mi. NE Ford City; San Luis Obispo County - Carrizo Plain; Bitterwater Valley.

The map given by the California Dept. of Fish and Game for the distribution of the blunt nosed leopard lizard is misleading, as it indicates the entire San Joaquin Valley. Apparently this lizard is no longer found in a large part of the San Joaquin Valley. Montanucci (1965) gives a much better distribution map and delineates where in the San Joaquin Valley this lizard has been extirpated (see distribution map).

DISTRIBUTION MAP

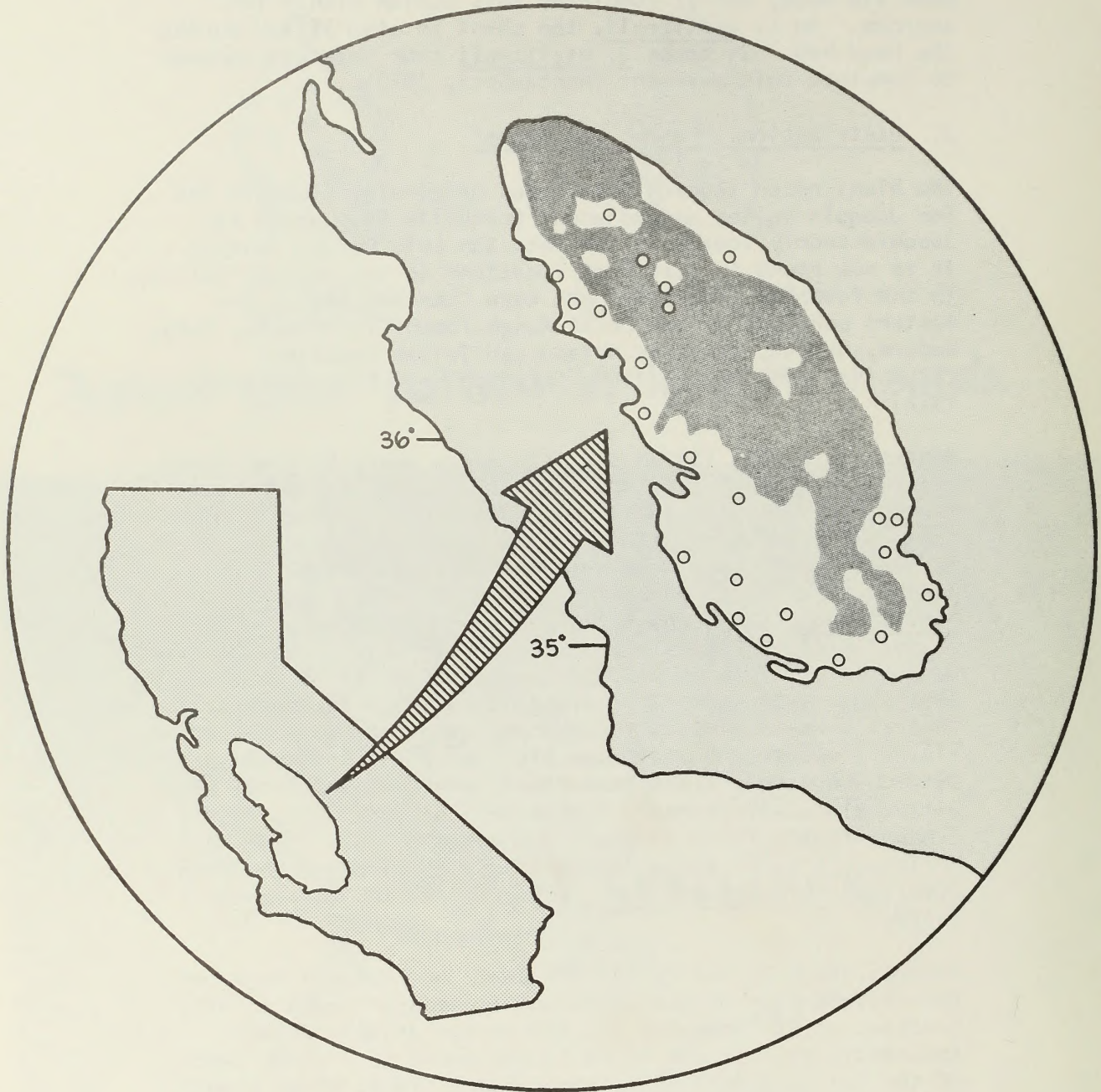


Fig. 2.--The San Joaquin Valley of Central California. Solid black line delimits range of Crotaphytus wislizenii silus; dots indicate localities sampled. Shading on the valley floor represents agricultural areas where wilus no longer occurs. (Adapted from the distribution map found in Herpetologica, Vol. 21, No. 4, page 280, with permission of its Editor.)

3. Status and Population Trend

The blunt nosed leopard lizard is endangered and on the verge of extermination. While population numbers are not known, Sheppard (1970) has made a rough estimate. He conducted a study in an area near Maricopa, in southwestern Kern County. This particular place was selected because he felt that it was prime habitat for the lizard.

Sheppard located thirteen C. silus in this sixteen-acre tract, which would indicate a population density of 300 to 340 blunt nosed leopard lizards per square mile of optimum habitat. Since it is highly unlikely that all of the lizard's habitat would be optimum, he considered the mean density of lizards to be 100 per square mile.

In 1970 there were around 600 square miles of saltbush scrub desert which had not been plowed along the west side of the San Joaquin Valley. He arrived at an estimated population of 60,000 C. silus in this area. The California Aqueduct was constructed along the eastern edge of this Atriplex belt and will be able to furnish water to nearly all of the remaining land along the west side of the San Joaquin Valley, thus threatening the continued existence of C. silus.

4. Life History

The blunt nosed leopard lizard is an active, diurnal species that is very elusive, wary, and moves very rapidly. When a lizard is approached, it lies flat and motionless. As a person moves nearer, it may suddenly dash to a burrow. When cover is scarce, it may run a considerable distance, stop, crouch low and run again. This "freezing" action is very pronounced. When crawling, it has a stiff but slight waddling gait. If cut off, it will run in circles until exhausted, then turn and face the pursuer, its mouth open. When running, it often holds its tail an inch or two above the ground. It usually runs in a straight line and occasionally runs bipedally, especially when great distances are covered.

Activity is partly correlated with the temperature. In early June the adults appear around 8:30 a.m. at a surface temperature of 82° and proceed to sun themselves. Most lizards take cover when the air temperature reaches 106°F., seeking shade in burrows, under bushes or by fence posts. Nocturnal activity has not been noted, and there is no evidence of winter activity.

At least male lizards establish territories. These may overlap, as males have been observed traversing the same area. A maximum distance of 50 feet is noted. When frightened, the lizard will run to its home burrow, but if danger is close it will cautiously enter any burrow. Large males with bites and scar marks are frequently collected, indicating aggressive behavior and territorial defense.

Predators of the lizard include the spotted skunk, ground squirrels, shrikes, the kestrel, the burrowing owl and the roadrunner. Possible predators include the coyote, the kit fox, the badger, the glossy snake, the long-nosed snake and the king snake.

The availability of food seems to govern what is eaten. The primary diet is locusts, cicadas, and small lizards. They also eat spiders, robber flies, hemipterans, larval lepidopterans, beetles and bees. Whether or not another lizard is taken seems to depend on its behavior. Lizards that move slowly tend not to be pursued. Those that become frantic and move quickly will be chased.

When stalking prey, the blunt nosed leopard lizard crawls forward slowly, occasionally swaying its head from side to side; this action may aid in judging the distance to potential prey. Rapid dashes forward facilitate the capture of prey.

Cannibalism occurs primarily when adults eat young of the previous season. Most of these young are less than 75 mm. long, snout-vent length, which approaches the lower limits of the size range for that age class (Montanucci, 1965, 1967, 1970; Stebbins, 1954).

Following breeding, the numbers of active adults decrease significantly. Females remain active longer than the males. The storage of fat has a lot to do with this difference. The males, by August, have more fat stored than the females because the females use some of theirs during egg production.

Hybridization between Crotaphytus silus and Crotaphytus wislizenii occurs along the Cuyama River drainage system in Ventura County, California. The ecotone between the grassland and the pinyon-juniper woodland is located between 2600 and 3600 feet, and this is where the hybrids are found. No parental types occur here, and the density of hybrids is very low. The small number of C. wislizenii indicate that the pinyon-juniper woodland is a suboptimal habitat for these lizards. However, the semi-arid grasslands located below 2600 feet in Cuyama Valley are optimum habitat for C. silus, and these lizards have been observed in substantial

numbers. The distribution of the hybrids closely coincides with the limits of the ecotone. C. silus apparently breeds with the hybrids in the vicinity of Santa Barbara and Ballinger Canyons north to the San Luis Obispo-Santa Barbara County line, where these two populations are sympatric. Back-crosses between the hybrids and C. wislizenii have not been observed, but these populations are nowhere sympatric, and the probability of finding such a cross is very low. The suboptimal nature of the ecotone is suggested by the greater density of the hybrid populations to the north where the ecotone begins to change to grassland or compared to areas well within the ecotone or its southern limits (Montanucci, 1965, 1967, 1970; Stebbins, 1954).

5. Reproduction

The reproductive cycle of the blunt nosed leopard lizard is subject to slight variation as a result of environmental conditions. May and June is usual for egg laying. There may be an occasional second brood. The mating season lasts from the latter part of April through May. Copulation has been observed as late as June 4. Males will often mate with several females.

The breeding color for males varies from bright salmon on the ventral surfaces and laterally to salmon pink only laterally to no color change at all. Color is controlled physiologically in that only sexually mature males develop color. Those without color probably lack the genetic potential for its development. Differences in the local environment may be significant enough to select for or against any of the color variations in different localities. Availability of cover, soil color, and/or intensity of predation and kinds of predators are selection factors involved.

Montanucci (1967) made five observations of captive leopard lizards in simulated natural conditions. A number of burrows were excavated and glass panels were placed against the cross sections to permit observations. The exposed areas were protected from sunlight with dark plastic sheets. Observations were made daily, but as the lizards got restless and entered their burrows, inspections were increased.

Egg laying occurred between 1-5 p.m., probably because sufficient warmth is available in the burrows at this time to enable the completion of egg laying.

The nesting habits of Crotaphytus silus and Crotaphytus wislizenii are almost identical, although C. silus lays fewer eggs and less time is required to deposit a clutch in a burrow.

When the female is ready to lay her eggs, she enters a chamber at around 50 cm depth in the burrow system. The nest is enlarged by alternate clawing with the forefeet followed by alternate kicking with the hind feet. Tunnels opening into the chamber are plugged by pushing earth forward into the mouth of each tunnel with the forefeet. The finished chamber may measure 100 mm. in diameter and 60 mm. in height. The lizard raises her body posteriorly with the hind legs extended back and somewhat out to the sides. As each egg is deposited, it is covered lightly with sand; the eggs are laid in a fairly close clutch. Then the exit tunnel is plugged.

The clutch size varies from two to five, with an average of three. The eggs are cream colored, later turning to chalk white, and measure 15-17 mm. by 25-28 mm. Incubation is around 57 days. The young appear as early as July 30 and are noted from August to September. They measure 42-47 mm. snout to vent, increasing to 65-75 mm. just prior to hibernation.

Following the second hibernation, males and females are sexually mature. There are no size differences between the sexes. Occasional male and female C. silus have been observed in close association, suggesting that some lizards may remain in pairs for several seasons.

6. Habitat Requirements

The blunt nosed leopard lizard occurs in sparsely vegetated plains, alkali flats, low foothills, canyon floors, large washes, and arroyos. It is usually found in a sandy location but sometimes in coarse, gravelly soil and hardpan. It prefers places with scattered low bushes, but otherwise open habitat. In areas heavily covered with Atriplex polycarpa or Allenrolfea occidentalis it is absent or scarce, presumably because of reduction of speed in locomotion and foraging.

Population density is somewhat correlated with the abundance of mammal burrows, primarily those belonging to kangaroo rats and abandoned squirrel burrows. They may also be found in abandoned badger dens and gopher burrows. Temporary cover such as rock piles, trash piles and brush are used by immature lizards, but adults will usually enter burrows for safety. (Montanucci, 1965, 1970; Stebbins, 1954; Cal. Dept. of Fish and Game, 1972).

7. Protective Measures Instituted

1. Fully protected under California state law
2. Declared endangered by the Secretary of the Interior and IUCN (International Union for the Conservation of Nature and Natural Resources)

8. Identification of Limiting Factors

Factors limiting the distribution are (1) agricultural practices, (2) flooding, (3) chaparral, (4) steep or extensive rocky areas, (5) subdivisions, (6) water control (diversions, dams, ditches), (7) grasshopper and leafhopper control programs in the western and southern parts of the valley (vast areas of Fresno and Kern Counties have been treated by planes using DDT and Malathion; entomologists report lizards killed by these insecticide applications).

Construction of California Highway 99 and Interstate 5 in Grapevine Canyon has probably extirpated the lizards that were living there, as 69 million cubic yards of earth were moved to build these roads.

In low areas of the valley, Allenrolfea occidentalis is indicative of wet ground subject to seasonal flooding, a factor in habitat limitation. Blunt nosed leopard lizards are very rarely found there.

The habitat preferred by these lizards is dwindling and will continue to dwindle as long as water is imported for agricultural purposes and housing developments in marginal areas.

(Montanucci, 1965, 1970; USDI, 1968; Cal. Dept. of Fish and Game, 1972).

9. Recommended Species and Habitat Management Techniques

1. Conduct surveys throughout the range of the lizard to determine the extent and status of existing populations.
2. Protect remnants of the habitat on public lands, such as the Naval Petroleum Reserve near Taft, and several wildlife refuges (Cal. Dept. of Fish and Game, 1972).

3. There is an apparent contact between C. silus and C. wislizenii along the Cuyama River drainage system in Ventura County, California. This is the area where hybridization has occurred (Montanucci, 1970). It would seem appropriate to consider some protection of C. wislizenii at least in this area, as well as the protection afforded C. silus because there is some similarity of appearance between these two lizards. Protection of the habitat in this area would permit biologists to monitor the interactions between the two species, thereby improving understanding of the specific ecological requirements of silus and wislizenii.
4. Determine the presence or absence of lizards on public lands before carrying out any projects which involve the importing of additional water supplies and decide on a course of action based on that knowledge.
5. R. R. Montanucci included several management recommendations in a personal communication: "Establishment of a National Grassland Preserve in parts of the San Joaquin Valley's western and/or southern portions would be the most rapid means of assuring protection for this species. Habitat in the preserve would be kept safe from irrigated or dry farming practices. However, management of the grasslands through moderate grazing either by native species, e.g. pronghorn antelope and dwarf tule elk, or by cattle and sheep would be necessary. Grazing of the grasslands would have the beneficial effect of maintaining "open habitat"--i.e., exposed areas with scattered shrubs and grasses which would allow normal foraging activity by these wide-ranging, diurnal lizards. Management by sheep grazing is the least desirable practice because of the threat of severe denudation of the grasses and shrubs which support insects, particularly Melanoplus grasshoppers, upon which Crotaphytus silus subsists (at times). Elimination of plant cover would increase intraspecific competition as well as augment the mortality rate by exposing lizards (especially hatchlings) to predators. Other deleterious practices in the past have included aerial spraying of Atriplex belts in the foothills to control beet leafhoppers. Massive spraying campaigns have resulted in the extirpation of non-target species and the disruption of the grassland food web. Vacated rodent burrows,

particularly those of the Beechey ground squirrel and the kangaroo rats, serve as nesting sites and hibernacula for Crotaphytus silus. Predator populations should be encouraged as they keep rodent populations in check. Severe rodent population explosions bring numerous grassland inhabitants into direct or indirect competition for food and shelter.

"To my knowledge no organization is presently involved with this species' welfare. The Nature Conservancy has acquired small tracts of habitat as wildflower preserves (San Ridge, 117 acres; Paul Paine Preserve, 40 acres; Pixley Vernal Pools, 40 acres), but these areas are insufficient in size to maintain viable populations of Crotaphytus silus and/or other species of vertebrates should surrounding habitat be converted to farmland. An alternative plan would call for increasing the size of these preserves by acquisition of land immediately adjacent to them. Tracts several thousand acres in size would be needed to maintain a viable grassland ecosystem."

10. Ongoing Research Projects

Studies are planned by Montanucci to determine density, movements and specific habitat requirements for this species.

11. Authorities

Richard R. Montanucci
Museum of Natural History
University of Kansas
Lawrence, Kansas 66044

12. Governmental, Private and International Organizations Actively Involved With This Species' Welfare

1. California Dept. of Fish and Game
The Resources Agency
1416 Ninth Street
Sacramento, California 95814
2. This agency is responsible for the protection of the blunt nosed leopard lizard. Presumably they will carry out population surveys as they recommended in At The Crossroads and establish protection for the habitat remnants.

13. Listing of Photographic Material Available for
Duplication

1. Cal. Dept. of Fish and Game has at least one photo of a blunt nosed leopard lizard. Cost unknown.
2. Richard R. Montanucci has used several different photographs in his publications and has made his photographic material available for BLM to copy.

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