Hazard, L. and J. Rotenberry. 1996. Herpetofauna and vegetation survey of Cornfield Spring and Piute Spring. Proceedings of the East Mojave Desert Symposium, 7-8 1992, University of California, Riverside. C. Luke, J. André, and M. Herring, eds. Natural History Museum of Los Angeles County Technical Reports, Number 10.

POSTER

Herpetofauna and Vegetation Survey of Cornfield Spring and Piute Spring, East Mojave Desert, California

Lisa Hazard and John T. Rotenberry,
Department of Biology and Natural Reserve System
University of California, Riverside

Introduction

Desert riparian habitats provide critical resources for desert animals. Piute Spring and Cornfield Spring, located in the Needles Resource Area of the California Desert District, are unique riparian habitats that could potentially contain rare fauna, including sensitive species that might need special management consideration. These sites were surveyed from April - June 1992 for reptile, amphibian, and vegetation species composition and relative abundance, to identify potential management and conservation needs.

Methods

Study Sites

Cornfield Spring, located in the Providence Mountains (section 11, township 10N, range 13E, San Bernardino County, California), is a large spring (about 3 meters wide) that runs through a canyon. The canyon is fairly narrow near the head (10-20 m), but widens to 20-50 m after merging with another small spring.

Piute Spring, located in the Piute Range of the eastern Mojave Desert (sections 13, 23, 24; township 12N, range 18E, San Bernardino County, California), is a small perennial spring which runs about 1.5 km through a narrow canyon (10-20 m).

At each site we established a number of transect lines perpendicular to the stream, and running the width of the canyon at each point. These transects were used for sampling both vegetation and herps.

Vegetation Survey

Habitat types inside and outside the canyons were identified using California Desert District Standard Habitat Site Codes (Holland, 1986) (Table 1) and mapped on an enlarged copy of the USGS map of each site. Plant species composition was also sampled along transects (Cornfield Spring) and randomly placed 2x2 m plots (Piute Spring).

Herpetological Survey

As there is no simple single standard for a community-level herp survey, we used a variety of herp sampling methods, including timed transects, pit trapping, artificial shelters, and incidental sightings. Species, number of individuals, age/sex information (if observed), time, and weather information were recorded for each observation.

Results

Vegetation Survey

Cornfield Spring had a fairly uniform vegetation composition, consisting mostly of Mojave Creosote Scrub and Mojave Desert Wash Scrub (Table 1, Fig. 1). The steep canyon slopes are mostly Sonoran Mixed Woody and Succulent Scrub. Vegetation is denser near the spring head, where the canyon is narrower. The dominant species at Cornfield Spring are *Larrea tridentata* and *Acacia greggii*. Other common species include *Bromus rubens, Eriogonum deflexum, Chrysothamnus nauseosus, Viguiera deltoidea,* and *Baccharis sergiloides* .

Piute Spring had a wider variety of vegetation than Cornfield Spring (Table 1, Fig. 2). The canyon ridge and areas beyond the spring are predominantly Mojave Creosote Scrub. Most of the canyon is Mojave Riparian Forest, which includes *Salix* spp., *Chilopsis linearis,* and *Tamarix,* all with a dense understory of *Salix exigua*. In addition, there are substan-

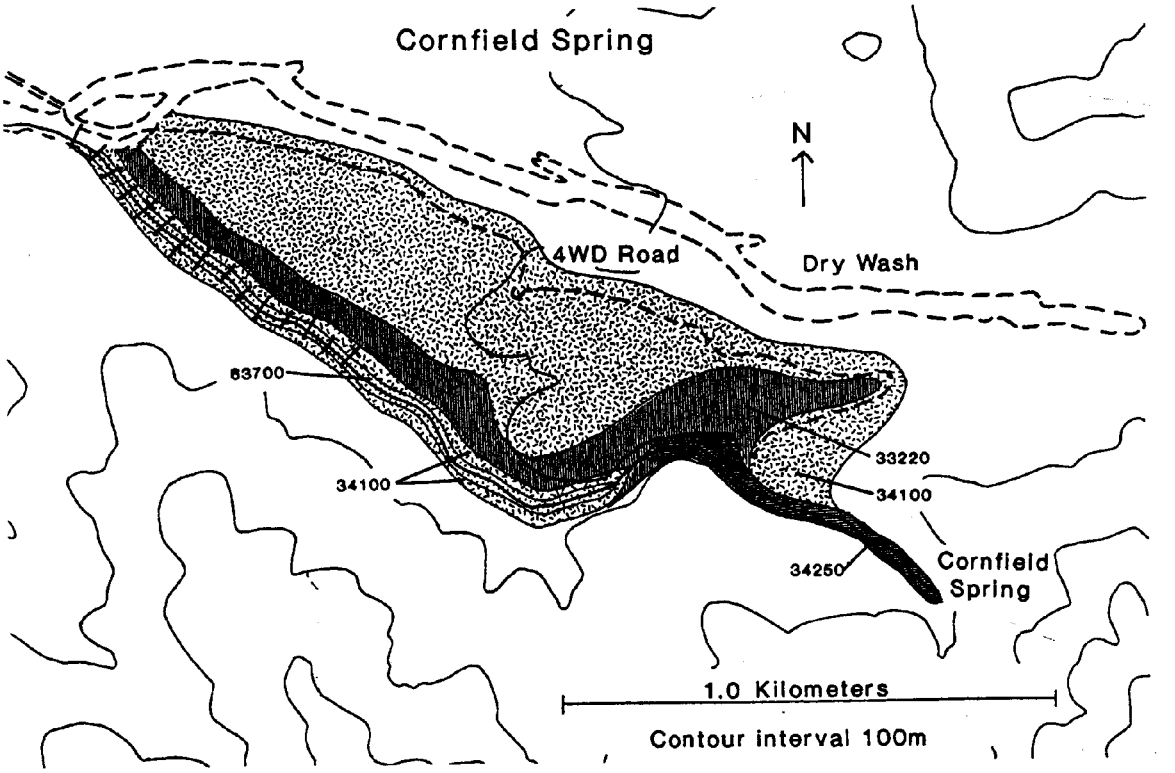

FIGURE 1. Habitat types at Cornfield Spring. Habitat classification and numbers according to Holland (1986). See Table 1 for descriptions of habitat types. Lines across stream indicate transect locations.

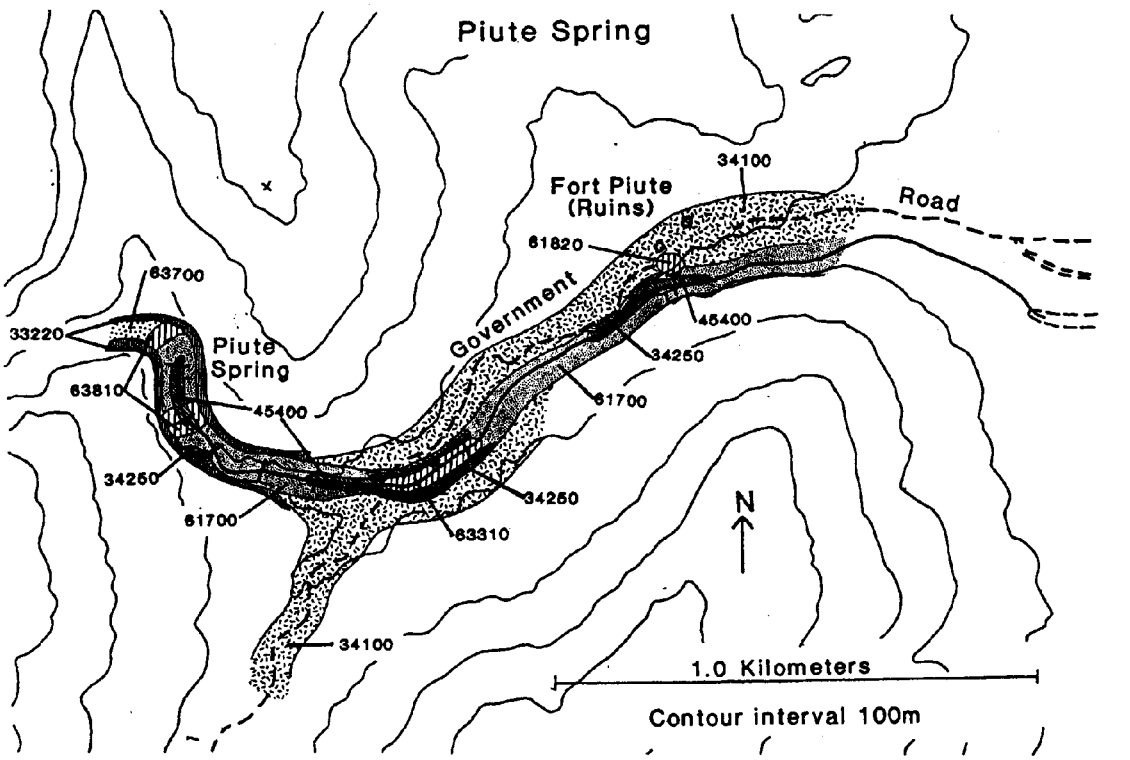

FIGURE 2. Habitat types at Piute Spring. Habitat classification and numbers according to Holland (1986). See Table 1 for descriptions of habitat types. Lines across stream indicate transect locations.

tial areas of Tamarisk Scrub, Mojave Desert Wash Scrub, Mulefat Scrub, Mesquite Bosque, Freshwater Seep, and Mojave Wash Scrub. Canopy cover ranged from 40 to 90%, and was mostly tall *Salix* spp. with a dense understory. Other common species included *Bromus rubens, Cirsium mohavense, Sphaeralcae ambigua,* and *Stanleya elata.*

Herpetological Survey

Many reptile species are difficult to find due to their secretive nature, small population size, or low population density. Transects gave the best indicator of relative abundance of the more common, visible species, but many less common or wary species were only seen once or twice in incidental sightings or pit traps.

At Cornfield Spring (Table 2), *Bufo punctatus* was the most common species observed, followed by *Uta stansburiana* and *Cnemidophorus tigris.* Approximately twice as many *U. stansburiana* as *C. tigris* were seen in the canyon at Cornfield Spring. All other species were only seen one or two times.

At Piute Spring (Table 2), the most numerous species were again *Bufo punctatus, Cnemidophorus tigris,* and *Uta stansburiana.* In contrast to Cornfield Spring, more *C. tigris* were seen in the canyon than *U. stansburiana,* although more *U. stansburiana* were seen on the canyon ridge.

Discussion

All of the reptile species observed at Cornfield Spring were desert species; only *Bufo punctatus* requires water for some stage of life. *B. punctatus* was very abundant at both sites, breeding from at least early April to late June, and probably beyond. *B. punctatus* typically breed in temporary pools formed by spring rains (Johnson, Bryant, and Miller, 1948), but Cornfield and Piute Springs provide longer lasting sites for breeding, increasing the chances of tadpoles surviving to metamorphosis, and possibly allowing adults to breed more than once in a season.

In addition to the abundant *Bufo punctatus,* another non-desert species, the ringneck snake, *Diadophis punctatus regalis* , was observed at Piute Spring. In addition to requiring permanent water in the arid portions of its range (Stebbins, 1985; Brode and Bury, 1984), it also likely feeds on the young toads and tadpoles. Ulmer (1983) found most of the lizards species we observed at Piute Spring in her study of the same locality, but there was no overlap between the four snake species observed in her study and the three found in our study.

Increased spatial heterogeneity directly influences the number of lizard species in an area (Pianka, 1967). Likewise, within a habitat, increased availability of water increases primary production, which increases lizard species diversity (Scheibe, 1987). The height and density of plant life at Piute Spring provides a variety of habitats for many species of reptiles and other animals. In approximately the same amount of time as was spent at Cornfield Spring, seven more species of herps were seen at or near Piute Spring. The increased diversity and density of vegetation made possible by the permanent water source has apparently resulted in an increase in herpetological diversity and density even over the increase at Cornfield compared to dry desert.

Conclusions

Cornfield and Piute Springs are critical areas for species requiring free water for at least some part of their lives, such as *Bufo punctatus, Diadophis punctatus regalis, Salix* spp., sedge, and cattail. These areas are also important to other, more desert-adapted species simply because of the abundance of food and shelter they provide. No other large or permanent water sources exist in the general vicinities of these sites, so anything impacting on these sites could have dramatic effects on the species found there. In areas without permanent water, reproduction by *Bufo punctatus* is frequently unsuccessful, since spring streams and summer pools may not last long enough for metamorphosis to be completed (Tevis, 1966).

Management Recommendations

1. Tamarisk invasion at Piute Spring has already resulted in loss of vegetation diversity in small but important areas. Further spread of tamarisk should be prevented, and existing tamarisk should be removed.

2. Cattle at Piute Spring have already caused some browsing damage; presence of cattle at either site should be prevented.

3. Human use of the sites at current levels does not seem to be a problem at either location. Very little litter was seen, and only two campfire sites were found at each location. However, continued use of the small mesquite stand near Fort Piute as a campsite could damage the trees. Because increased use of the areas could pose a problem, BLM should regularly monitor both sites in order to respond to increased use in a timely manner.

ACKNOWLEDGMENTS

The University of California Natural Reserve System provided transportation to the Eastern Mojave Desert, and the US Bureau of Land Management provided equipment, field assistants, and transportation to the sites. Thanks are due to field assistants Becca Hooker, Carrie Alley, and Colleen Lee for their valuable help.

TABLE 1. California Desert District Standard Habitat Site Codes (Holland, 1986) observed at Cornfield and Piute Springs, Eastern Mojave Desert.

Code	Habitat Name Characteristic Species	Cornfield	Piute
33220	Sonoran Mixed Woody and Succulent Scrub	+	+
	Acacia greggii		
	Echinocactus acanthodes		
	Encelia farinosa		
	Ferocactus acanthodes		
	Opuntia spp.		
34100	Mojave Creosote Scrub	+	+
	Ephedra nevadensis		
	Hymenoclea salsola		
	Larrea tridentata		
34250	Mojave Wash Scrub	+	+
	Acacia greggii		
	Chrysothamnus nauseosus		
	Hymenoclea salsola		
	Rhus trilobata		
	Chilopsis linearis		
45400	Freshwater Seep		+
	Carex sp.		
	Typha sp.		
61700	Mojave Riparian Forest		+
	Populus fremontii		
	Salix exigua		
	Salix spp.		
	Chrysothamnus nauseosus		
	Tamarix sp.		
61820	Mesquite Bosque		+
	Larrea tridentata		
	Prosopis glandulosa		
63310	Mulefat Scrub		+
	Baccharis viminea		
	Carex sp.		
	Salix exigua		
63700	Mojave Desert Wash Scrub	+	+
	Acacia greggii		
	Chilopsis linearis		
	Ephedra nevadensis		
	Baccharis spp.		
63810	Tamarisk Scrub		+
	Tamarix spp.		
	Typha sp.		
	Salix exigua		

TABLE 2. Reptile and amphibian species observed at or near Cornfield and Piute Springs.

	Cornfield Spring	Piute Spring
Class Amphibia		
Order Salentia		
Family Bufonidae		
	Bufo punctatus	***Bufo punctatus***
Class Reptilia		
Order Testudines		
Family Testudinidae		
		Gopherus (Xerobates) agassiziit
Order Squamata		
Family Gekkonidae		
	Coleonyx variegatus	
Family Iguanidae		
	Dipsosaurus dorsalis†	*Dipsosaurus dorsalis†*
	Callisaurus draconoides†	*(Sauromalus obesus) ?*
	Crotaphytus insularis†*	***Callisaurus draconoides***
	Uta stansburiana	*Crotaphytus insularis**
	Phrynosoma platyrhinos	*Gambelia wislizeniit*
		Sceloporus magister
		Uta stansburiana
		Urosaurus graciosus
		Phrynosoma platyrhinos†*
Family Teiidae		
	Cnemidophorus tigris	***Cnemidophorus tigris***
Family Colubridae		
		Diadophis punctatus regalis
		Salvadora hexalepis
		Lampropeltis getulus
		unID'd snake- racer/gopher?†
Family Viperidae		
	*Crotalus mitchellii**	

* observed on canyon ridge near sampled area
† observed on unpaved road into site (up to 4 miles from site)
Bold type indicates the more abundant species observed.

Brode, J. M., and R. B. Bury. 1984. The importance of riparian systems to amphibians and reptiles. In *California riparian systems* (R. G. Warner and K. M. Hendrix, eds.), pp. 30-36. Univ. California Press, Berkeley, California.

Holland, R. F. 1986. Preliminary descriptions of the terrestrial natural communities of California. California Department of Fish and Game, Sacramento, California.

Johnson, D. H., M. D. Bryant, and A. H. Miller. 1948. Vertebrate animals of the Providence Mountains area of California. *Univ. California Publications in Zoology* 48: 221-375.

Pianka, E. R. 1967. On lizard species diversity: North American flatland deserts. *Ecology* 48: 333-51.

Scheibe, J. S. 1987. Climate, competition, and the structure of temperate zone lizard communities. *Ecology* 68: 1424-36.

Stebbins, R. C. 1985. *A Field guide to western reptiles and amphibians.* Houghton Mifflin Company, Boston, Massachusetts.

Tevis, L. Jr. 1966. Unsuccessful breeding by desert toads (*Bufo punctatus*) at the limit of their ecological tolerance. *Ecology* 47: 766-75.

Ulmer, L. 1983. Piute Creek herpetofaunal inventory. USDI, Bureau of Land Management. US Department of Defense, Naval Resource Area. Unpublished report.