

Determining the Susceptibility of Springs and their Anuran Communities in the Mojave to Climatic Change and Development

Anthropogenic and global climatic changes can have negative effects on surface water. These concerns led the Inventory and Monitoring program of the National Park Service to investigate the biological, hydrological, and geochemical attributes at selected springs within the Mojave Network of Parks. These springs included Darwin Falls at Death Valley National Park, Piute Spring at the Mojave National Preserve, and Fortynine Palms Oasis at Joshua Tree National Park.

USGS Western Ecological Research Center (WERC) and USGS California Water Science Center worked jointly over a two year period to collect biotic and aquatic data to assess the susceptibility of these springs and their associated anuran species to water quality and quantity impacts resulting from climate change and ground-water development.

The objectives for USGS WERC were to measure aquatic habitat variables, determine the anuran species present and their distributions, estimate population sizes of the anuran communities, and assess the general health of these communities within the study areas. Day and nighttime visual encounter surveys were conducted three times in 2005 and in 2006 at each of the three study sites. Field visits included tissue collection, toe clipping, visual health inspections, and chytrid swabbing.

Because complete analysis of the data collected in both years are pending, the overall findings herein are preliminary. The next steps are to



interpret the data collected and make recommendations for management of these resources.

Preliminary Findings

Death Valley National Park (Darwin Falls)

- Historically (1920s – 1960s), the red-spotted toad (*Bufo punctatus*) was found to be the only toad that occurred at this site. The first documentation of local sympatry between the western toad (*Bufo boreas*) and the red-spotted toad was in the 1970s, when hybridization was found to occur (Feder 1979).
- The red-spotted toad was not observed during our surveys and has not been detected since the early 1980s, apparently having been extirpated by the western toad.
- The western toad was encountered throughout this site during the 2006 sampling year and the population was estimated to contain 231 adults (95% CI 221-369) using the Schnabel method.

Mojave National Preserve (Piute Spring)

- In the 2006 sampling season, we documented a higher than average (>2%) deformity rate of red-spotted toads. Past studies did not mention the presence of deformities at this site (McGurty 1977, Ulmer 1983, Hazard & Rotenberry 1996, Persons & Nowak 2004.).
- Overall, 39 toads with deformities were documented, with a subset sent to David Green at the USGS National Wildlife Health Center for further analysis.
- The source of these deformities is not known, and could range from parasites, to herbicide use for tamarisk removal, to contaminated ground water from gold mining in the upper watershed.
- The red-spotted toad was found throughout the study site with a population estimate of 276 adults (95% CI 221-369) using the Schnabel method of estimation for the 2006 sampling season.

- Using the Schnabel method of estimation the red-spotted toad population was estimated at 153 (95% CI 112-242) and the California treefrog at 119 (95% CI 98-151) for 2006. Both species appear to have declined >50% over the last 35 years.



Western toad found at Darwin Falls, Death Valley National Park.



Red-spotted toad from Piute Spring at Mojave National Preserve with hind limb missing.

Joshua Tree National Park (Fortynine Palms Oasis)

- The red-spotted toad and the California treefrog (*Pseudacris cadaverina*) were known to inhabit this site.
- Research conducted from 1969-1971 (Welbourn & Loomis 1975) estimated the population of the red-spotted toad and the California treefrog at 300 and 288, respectively. National Park biologists were concerned that the populations had decreased dramatically, with special concern for the California treefrog.



California treefrog from Fortynine Palms Oasis at Joshua Tree National Park with the parasite, *Hannemania hylae*.

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