7

Effects of Habitat Fragmentation on Reptiles and Amphibians in Coastal Sage Scrub and Grassland Communities

Gary Busteed and Jim Dole

Department of Biology, California State University, Northridge, CA. 91330

Lay Report Prepared for the Western National Parks Association

Grant # 01-13

Habitat loss and fragmentation are the leading causes for the extinction of species and declines in biodiversity. In fragments, the extent of species loss is dependent upon the size and shape of the remaining habitat. Other activities such as brush removal to reduce fire hazards, increased soil moisture from the irrigation of urban landscapes, and the intentional or unintentional introductions of exotic plants and animals may also have additive impacts in urban environments. Although several studies have examined the effects of fragmentation on a variety of species, relatively few have investigated the impacts on reptiles and amphibians. Reptiles and amphibians however are valuable indicators of impacts as they are especially vulnerable to changes in their environment because of relatively low numbers and habitat specificity.

In and adjacent to the Santa Monica Mountains National Recreation Area, urban development creates habitat fragments of varying sizes. Some fragments are only a few acres of hillside habitat surrounded by development while others are a few hundred acres of city, county or federal parkland. Because of the variety of habitat sizes, this study tested how habitat availability affects species diversity and abundance. The study included twelve habitat fragments; seven of the 12 sites were classified as small (20-112 acres), three as medium-sized (810-1100 acres) and two were classified as large contiguous tracts of land.

A total of 1,957 individual reptiles and amphibians, comprised of twenty species, were captured from 12 October 2000 to 21 August 2002. Lizards accounted for 82% (1,607) of all individuals captured. Six species were represented: western fence lizards, side-blotched lizards, western skinks, alligator lizards, coastal western whiptail lizards and silvery legless lizards. Four species of amphibians—two species of slender salamanders, Pacific treefrogs, and western toads—accounted for 12% (232) of the captures. The remaining 6% (118) consisted of ten species of snakes: gopher snake, California kingsnake, western ringneck snake, striped racer, yellow-bellied racer, red coachwhip, southern-Pacific rattlesnake, black-headed snake and night snake.

Species diversity was strongly correlated with habitat size, with smaller habitats harboring significantly fewer species. Four species common in large habitats (western toad, Pacific treefrog, southern-Pacific rattlesnake, striped racer) were absent in the smallest patches. The absence of these species is most likely associated, at least in part,

with factors accompanying urbanization that were not measured, such as proximity of trapping sites to urban development (Pacific rattlesnakes, striped racers), the absence of ponds or streams for reproduction (western toad, Pacific treefrog), and the presence of introduced species (western blindsnake, coast horned lizard). Surprisingly, one species, the side-blotched lizard, was most abundant in small patches. One reason for this abundance could be due to a greater proportion of unvegetated habitat (which this species prefers) created by anthropogenic activity (*eg.* brush clearance for fire prevention, roads and trails) in the small patches.

Fragment size was not the only relevant factor associated with species presence and abundance. Vegetative cover, not patch size, was an important factor governing the presence and abundance of western fence lizard and western skink. Western fence lizards were more associated with woody habitats, which are commonly used for perching and mating displays. Western skinks preferred grasslands that provided ground cover.

Several of the species that were captured were also documented for the first time in the Simi Hills. One species, the Pacific slender salamander was found in a single isolated habitat fragment. It is hoped that DNA collected from this species can be examined to determine its origin or relatedness to its nearest population in the San Gabriel Mountains. The western blind snake was also captured in this study and is a new record for the Simi Hills. Previously, the western blind snake had only been documented in sandy-coastal environments in the Santa Monica Mountains; its discovery in this study hints at alternative habitat requirements for this species.

Many species were rare and infrequently captured; snakes, in particular, were rarely seen or captured. We suspect that these and other rare species may be vulnerable to future declines and extinctions, particularly in smaller fragments that may only harbor a few individuals of a particular species. Therefore, the largest habitats are the most valuable for reptile and amphibian conservation. Interestingly however, two species of snake, gopher snakes and California kingsnakes, were found in small habitats and in some cases with relatively large individuals. How these individuals of these two species utilize resources in these small fragments is unknown, future studies into how they utilize resources in small fragments may provide some answers. Although the ideal conservation strategy would be to maintain the largest habitats, one alternative that is suggested by conservation biologists would be to save several smaller fragments that cumulatively may be similar in diversity. Although, diversity increased when looking at small fragments cumulatively, diversity was still significantly less than one large contiguous habitat. Also, only coastal sage scrub and grassland communities were sampled in this study, which were the two predominant vegetation types in fragmented habitats. In the larger habitats, oak woodlands and riparian environments are also present, which have other species associated with them, but were not sampled in this study.

We found that small habitats can provide refugia for some species, however even small inconspicuous species like reptiles and amphibians can be impacted by habitat fragmentation. Future studies on individual species regarding home range, diet and microclimate requirements (such as soil moisture or soil type) may shed more light on what allows some to thrive and others to go extinct. The techniques used in this study are now being adopted by the National Park Service for use in other areas and habitats of the Santa Monica Mountains. In addition, new theories and projects are being designed to better understand species and habitat associations. Genetic work from tissue collected will be examined to determine inter-relatedness of individuals in highly fragmented environments. Also, invertebrates are being collected to understand the impacts associated with the proximity to urban development and changes in diet that alter reptile and amphibian abundances and diversity. Finally, although conclusions have been drawn on this Western National Park Association study, the National Park Service will continue this project in hopes of drawing further conclusions about the impacts of habitat fragmentation.