Post-Cedar Fire Arroyo Toad (*Bufo californicus*) Monitoring Surveys at Cuyamaca Rancho State Park, 2004

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Description of the project: In 2002 and 2003, California State Parks contracted with the U.S. Geological Survey to conduct daytime habitat evaluation and focused nocturnal surveys to determine the distribution of suitable habitat and presence of arroyo toads (*Bufo californicus*) within Cuyamaca Rancho State Park (CRSP). While these surveys documented breeding populations of arroyo toads at four high quality sites along the Sweetwater River, the status of the arroyo toad population within CRSP was in question following the Cedar Fire. In this 2004 study, we assessed the degree of direct mortality of arroyo toads as well as loss or alteration of toad habitat due to this massive fire and subsequent landscape changes (e.g., erosion). Surveying the entire length of the Sweetwater River within CRSP (not just the four sites surveyed in 2002 and 2003) was an important step in the 2004 surveys, to locate habitat patches that have increased or decreased in suitability for arroyo toads following the changes caused by the fire.

Study objectives:

1) Determine if the suitability for occupation by the arroyo toad has decreased as a result of the Cedar Fire;
2) Quantify fire severity levels among the four sites identified as high-quality arroyo toad habitat in 2002 and 2003;
3) Determine the post-fire distribution of the arroyo toads at CRSP; and
4) Assess whether the fire altered the arroyo toad's breeding temporally and/or spatially.

Methodology or approach: We used three types of surveys across the entire Sweetwater River within CRSP that consisted of: 1) daytime habitat evaluation surveys, 2) shrub skeleton transects, and 3) nocturnal presence/non-detection surveys. We covered the river channel and the immediately-adjacent upland habitat in a reach-by-reach fashion. Each 250-m stretch of the river was evaluated as to its habitat quality relative to the arroyo toad's key requirements - the presence of sandy substrate in the channel, sandy banks, flat and exposed sandy terraces immediately adjacent to the channel, and channel braiding. Furthermore, the reaches were surveyed diurnally and nocturnally for all life history stages of the arroyo toad and associated animal species.

Accomplishments/Results: Of a total 16.9 km (10.5 mi) of riparian habitat surveyed, 7.7 km, or nearly half of the river within CRSP, was rated as high (3.6 km) or good (4.1 km) quality habitat for arroyo toads in the year immediately following the Cedar Fire. We suggest that the substantial increase in the amount of suitable habitat found relative to the 2002 and 2003 surveys may be due to a few factors. In general, the fire decreased much vegetation, opening up some reaches to go through geomorphological changes which favored arroyo toad inhabitation. The fire's removal of considerable vegetation throughout CRSP may have translated into lower evapotranspiration levels, which left

more surface water on site. With more open land, we were simply able to survey more reaches to determine whether they were suitable or not, whereas many may have not been accessible in the pre-fire state. Furthermore, due to 2004 being another year with less-than-normal rainfall, large-scale erosion did not take place, and many arroyo toad breeding sites were not filled up with debris. Correspondingly, arroyo toads (particularly the immature stages) were abundant in the lower third of the Sweetwater River, found virtually continuously along a 5.2-km stretch of river. Breeding individuals and large numbers of young were also detected in the middle of the River within CRSP, at the largest site identified as occupied in the previous two years.

The other half of the reaches, which were characterized as unsuitable, may have been denied surface water and more potential breeding sites because of the low rainfall. Much of these unsuitable reaches were not supplied with runoff water from the local school camp, which supplemented the year-round flow of the lower half of the River in CRSP. However, we recorded a large adult female at the highest known elevation (1,354 m; 4,442 ft) for arroyo toad occurrences in the Sweetwater River watershed, in a severely burned, dry portion of the river several kilometers upstream from the nearest surface water. In summary, it appears that the timing – fall, when most juvenile and adult arroyo toads were underground and out of harm's way in their upland burrow sites – and nature of the Cedar Fire and subsequent rainfall resulted in geomorphologic patterns that were not detrimental, but perhaps instead beneficial, to the arroyo toad population at CRSP.

Benefits to California State Park and people of California: The results of this study will help State Park officials understand the potential effects of a large-scale fire on a federally endangered native amphibian. They can make management decisions regarding necessary post-fire restoration plans or changes to pre-fire recreational uses based on the current arroyo toad distribution data we gathered. The public will benefit from this study by both learning the important and often unpredictable role that fire plays in sculpting natural communities, and receiving explicit information as to where they can continue to recreate in CRSP without negatively impacting the arroyo toad.