

metapopulations). Within these 758 sites, 330 populations exist for which we have evidence of successful reproduction. Overall, we estimate that 22 percent of the remaining mountain yellow-legged frog sites within the Sierra Nevada are found within the national forests (including those with and those without evidence of successful reproduction), while 78 percent are found within the national parks (including those with and those without evidence of successful reproduction). These percentages represent the number of sites within the national forests and the national parks of the Sierra Nevada; they do not represent the number of individuals present at each site. The methods for measuring the numbers of populations and metapopulations in the national forests and the national parks have not been standardized and, therefore we must use caution when we compare national forests numbers to national park numbers. However, the remaining populations of mountain yellow-legged frogs are more numerous and larger in size in the national parks than in the national forests.

National forests with extant populations of mountain yellow-legged frogs include the Plumas National Forest, Tahoe National Forest, Humboldt-Toiyabe National Forest, Lake Tahoe Basin Management Unit (managed by the U.S. Forest Service (USFS)), Eldorado National Forest, Stanislaus National Forest, Sierra National Forest, Sequoia National Forest, and Inyo National Forest. National parks with extant populations of mountain yellow-legged frogs include Yosemite National Park, Kings Canyon National Park, and Sequoia National Park.

Grinnell and Storer (1924) first observed declines of mountain yellow-legged frog populations. Since then, a number of researchers have reported that the mountain yellow-legged frog has disappeared from a significant portion of its historic range in the Sierra Nevada (Hayes and Jennings 1986; Bradford 1989; Jennings and Hayes 1994; Bradford *et al.* 1994a; Jennings 1995, 1996; Stebbins and Cohen 1995; Drost and Fellers 1996; Knapp and Matthews 2000). The observed declines of mountain yellow-legged frog populations in the 1970s were small relative to the declines observed during the 1980s and 1990s. Rangewide, it is estimated that mountain yellow-legged frog populations have undergone a 50 to 80 percent reduction in size (Bradford *et al.* 1994a; Jennings 1995; Stebbins and Cohen 1995; Drost and Fellers 1996; Jennings 1996; Knapp and Matthews

2000). The most pronounced declines have occurred north of Lake Tahoe in the northernmost 125 km (78 mi) portion of the range, and south of Sequoia and Kings Canyon National Parks in Tulare County in the southernmost 50 km (31 mi) portion, where only a few populations remain (Fellers 1994; Jennings and Hayes 1994). Based on available USFS survey and observation data, there appear to be very few or no known large populations north of the Plumas National Forest.

Mountain yellow-legged frogs historically occurred in Nevada on the slopes of Mount Rose in Washoe County and probably in the vicinity of Lake Tahoe in Douglas County (Linsdale 1940; Zweifel 1955; Jennings 1984). In 1994 and 1995, mountain yellow-legged frog surveys were conducted by Panik (1995) at 54 sites in the Carson Range of Nevada and California, including eight historic locations; no mountain yellow-legged frogs were observed. A few scattered and unconfirmed sightings were reported in Nevada in the late 1990s, but any populations remaining in this State are likely to be extremely small and the species is thought to be extirpated from Nevada (R. Panik, Western Nevada Community College, *in litt.*, 2002).

The number of extant populations of the mountain yellow-legged frogs in the Sierra Nevada is greatly reduced. Remaining populations are patchily scattered throughout nearly all their historic range (Jennings and Hayes 1994; Jennings 1995, 1996). At the northernmost portions of the range in Butte and Plumas counties, few populations have been seen or discovered since 1970 (Jennings and Hayes 1994). Declines have also been noted in the central and southern Sierra (Drost and Fellers 1996). In the southern Sierra Nevada (Sierra, Sequoia, and Inyo National Forests; and Sequoia, Kings Canyon, and Yosemite National Parks), there are relatively large populations (*e.g.*, breeding populations of over 20 adults) of mountain yellow-legged frogs; however, in recent years, some of the largest of these populations have been extirpated (Bradford 1991; Bradford *et al.* 1994a; R. Knapp, Sierra Nevada Aquatic Research Laboratory, *in litt.* 2002). Mountain yellow-legged frog populations are more numerous and larger in size in the national parks of the Sierra Nevada than in the surrounding USFS lands (Bradford *et al.* 1994a; Knapp and Matthews 2000).

Between 1988 and 1991, Bradford *et al.* (1994a) resurveyed sites known historically (between 1955 and 1979) to have contained mountain yellow-legged frogs. They resurveyed 27 historic sites

on the Kaweah River, a western watershed within Sequoia National Park, and did not detect mountain yellow-legged frogs at any of these locations. They resurveyed 21 historic sites within the Kern, Kings, and San Joaquin River watersheds in Sequoia and Kings Canyon National Parks, and detected mountain yellow-legged frogs at 11 of these sites. Frogs were detected at three locations out of 24 historic sites outside of Sequoia and Kings Canyon National Parks. Rangewide, their resurvey effort detected mountain yellow-legged frogs at 14 of 72 historic sites, representing an 80 percent population decline. On the basis of these results, Bradford *et al.* (1994a) estimated a 50 percent population decline in Sequoia and Kings Canyon National Parks, with more pronounced declines elsewhere in the mountain yellow-legged frog's range.

Drost and Fellers (1996) surveyed for mountain yellow-legged frogs at sites documented by Grinnell and Storer (1924) in the early part of the 20th Century. The frog was reported to be the most common amphibian where they surveyed in the Yosemite area (Grinnell and Storer 1924). Drost and Fellers (1996) repeated Grinnell and Storer's 1924 survey and reported mountain yellow-legged frog presence at only 2 of the 14 sites where this animal had been previously detected. These two positive sightings consisted of a single larva at one site and a single adult female at another site. Drost and Fellers (1996) identified and surveyed 17 additional sites with suitable mountain yellow-legged frog habitat, and these surveys resulted in the detection of three additional populations.

For the 86 historically occupied mountain yellow-legged frog sites documented between 1915 and 1959 and resurveyed by Bradford *et al.* (1994a) and Drost and Fellers (1996), an 80 percent decline occurred in the number of historical frog populations. Of the 86 historic sites, only 16 remained occupied at the time of resurvey.

Knapp and Matthews (2000) surveyed more than 1,700 high elevation (averaging 3,400 m (11,150 ft)) lakes and ponds in the Sierra National Forest's John Muir Wilderness Area and in Kings Canyon National Park, encompassing a total of approximately 100,000 hectares (ha) (247,000 acres (ac)). They found a strong negative correlation between introduced trout and the distribution of mountain yellow-legged frogs. In the summer of 2002, Knapp (*in litt.* 2002) resurveyed 302 water bodies determined by 1995 to 1997 surveys to be occupied by mountain yellow-legged frogs, and