

approximately half of previously occupied locations in Sequoia and Kings Canyon Parks by the late 1980s (Bradford *et al.* 1994a). On the basis of surveys, Bradford *et al.* (1994a) estimate that mountain yellow-legged frogs have been extirpated from half of their historic locations in Sequoia and Kings Canyon National Parks. For example, Fellers (1994) surveyed in Sequoia and Kings Canyon National Parks and did not detect the mountain yellow-legged frog in the Kaweah watershed where the species was located historically.

In 1997, Knapp and Matthews (2000) surveyed 1,059 lakes, ponds, and other water bodies in Kings Canyon National Park. Mountain yellow-legged frog adults were found in 31 percent of these water bodies, and frog larvae in 20 percent (Knapp and Matthews 2000). Some significant frog populations remain in Sequoia and Kings Canyon National Parks, but extensive declines have been described. In 2002, Knapp (*in litt.* 2002) resurveyed 274 water bodies occupied by mountain yellow-legged frogs in 1997, and he also resurveyed 626 of the 785 sites where frogs were not detected in 1997. Knapp found no change in status at 60 percent of the 274 previously occupied sites, but found that 39 percent of the 274 previously occupied sites had gone extinct, while colonization had occurred at 7 percent of 626 previously unoccupied sites.

Currently in Sequoia and Kings Canyon National Parks, 507 mountain yellow-legged frog sites are known, most of which occur within 36 different basins that have multiple breeding populations that are hydrologically connected, so that the populations within each basin function as a metapopulation. Fifty-four sites have populations of more than 100 adult mountain yellow-legged frogs, 25 sites have populations between 51 and 100 adults, 132 sites have populations between 10 and 50 adults, and 296 sites have fewer than 10 adults. Of the 507 mountain yellow-legged frog sites in Sequoia and Kings Canyon National Parks, breeding evidence has been found at 259 populations (R. Knapp *in litt.* 2002).

*Sequoia National Forest:* Jennings and Hayes (1994) indicate that the mountain yellow-legged frog has been extirpated from a number of historical locations in the Sequoia National Forest. Mountain yellow-legged frogs were collected on several historic locations of the Kern Plateau in Sequoia National Forest (Jennings and Hayes 1994). Today, two known extant populations exist on the Sequoia National Forest (S. Anderson, USFS, *in litt.* 2002).

All of the recent mountain yellow-legged frog sightings from the Sequoia National Forest have been of single frogs or very small populations. In 1992, mountain yellow-legged frogs were not detected during amphibian surveys conducted at 17 sites in Sequoia National Forest (Martin 1992). The species appears to be severely reduced in numbers and range in the Sequoia National Forest.

#### **Distinct Vertebrate Population Segment**

Under the Act, we must consider for listing any species, subspecies, or, for vertebrates, any distinct population segment (DPS) of these taxa if there is sufficient information to indicate that such action may be warranted. To implement the measures prescribed by the Act, we, along with the National Marine Fisheries Service (National Oceanic and Atmospheric Administration—Fisheries), developed a joint policy that addresses the recognition of DPSs for potential listing actions (61 FR 4722). The policy allows for a more refined application of the Act that better reflects the biological needs of the taxon being considered, and avoids the inclusion of entities that do not require the Act's protective measures.

Under our DPS Policy, we use two elements to assess whether a population segment under consideration for listing may be recognized as a DPS. The elements are: (1) the population segment's discreteness from the remainder of the species to which it belongs; and (2) the significance of the population segment to the species to which it belongs. If we determine that a population segment being considered for listing is a DPS, then the level of threat to the population is evaluated based on the five listing factors established by the Act to determine if listing it as either threatened or endangered is warranted.

*Discreteness.* Under our DPS Policy, a population segment of a vertebrate species may be considered discrete if it satisfies either one of the following two conditions: (1) it is markedly separated from other populations of the same taxon as a consequence of physical, physiological, ecological, or behavioral factors. Quantitative measures of genetic or morphological discontinuity may provide evidence of this separation; or (2) it is delimited by international governmental boundaries within which significant differences in control of exploitation, management of habitat, conservation, status, or regulatory mechanisms exist. The proposed DPS, the Sierra Nevada mountain yellow-legged frog, is based on the first

condition, the marked separation from other populations.

The range of the mountain yellow-legged frog is divided by a natural geographic barrier, the Tehachapi Mountains, which geographically isolates the populations in the southern Sierra Nevada from those in the mountains of southern California. The distance of the geographic separation is about 225 km (140 mi). The geographic separation of the Sierra Nevada and southern California mountain yellow-legged frogs was recognized in the earliest description of the species by Camp (1917), who treated specimens from the two areas as separate subspecies of *R. boylei*. Camp (1917) described the two subspecies based on differences in their biogeography and morphology.

Ziesmer (1997) analyzed vocalizations of mountain yellow-legged frogs from 86 locations in Alpine and Mariposa counties in the Sierra Nevada, and vocalizations of mountain yellow-legged frogs from 23 locations in the San Jacinto Mountains of Riverside County in southern California. The vocalizations of Sierra Nevada frogs differed from those of southern California frogs in pulse rate, harmonic structure, and dominant frequency. Ziesmer (1997) concluded that the differences in vocalization supported the hypothesis that mountain yellow-legged frogs from the Sierra Nevada and southern California may represent separate species.

Genetic analyses support the discreteness of the mountain yellow-legged frog populations in southern California from those in the Sierra Nevada. In an allozyme (genetic) study that compared mountain yellow-legged frogs from the central Sierra Nevada with those from southern California, a fairly significant genetic difference was found between the two populations (D. Green, McGill University, *in litt.* 1993). However, because there were no frog samples from the southern Sierra Nevada for comparison, it was not clear whether the difference reflected two ends of a cline (a character gradient), or distinctions between the Sierra Nevada and southern California populations. Thus, because the data set was incomplete, Green (*in litt.*, 1993) interpreted the results cautiously.

A phylogenetic analysis of mitochondrial deoxyribonucleic acid (DNA) sequences of the mountain yellow-legged frog was performed throughout its distribution (Macey *et al.* 2001). This study concluded that there are two major genetic lineages of the mountain yellow-legged frog (inclusive of the Sierra Nevada populations and