

3.1 Red-Legged Frog Recovery

Author: Jack Topel¹

Amphibians (frogs, toads, newts, salamanders) are important indicators of ecosystem health. Most amphibians spend a portion of their lives in water, to breed and reproduce, and a portion on land. Amphibians absorb gases and liquids directly through their porous skin. This property makes amphibians extremely sensitive to changes in the environment, as along with absorbing oxygen and water, their skin also absorbs air- and water-born pollutants.

Globally, amphibian populations are in steep decline. Almost one-third of amphibians (more than 1,800 species) are threatened. Many factors have played a role in the worldwide decline of amphibians, including: fragmentation and loss of habitat through urban and agricultural development, diseases, climate change, widespread use of pesticides, pollution, and the introduction of non-native species (AmphibiaWeb 2015). In California, fourteen amphibians are listed as threatened or endangered. One of these species, the California red-legged frog (*Rana draytonii*, red-legged frog hereafter), is of particular concern to biologists working in the Santa Monica Mountains.

The red-legged frog is the largest native frog in the western United States. Once widespread and abundant in almost all central and Southern California coastal watersheds and the Central Valley, the red-legged frog has been extirpated from more than 70% of its historic range. Statewide, the U.S. Fish and Wildlife Service has determined that the red-legged frog is currently found in only 238 streams in 31 California counties. The U.S. Fish and Wildlife Service listed the red-legged frog as Federally Threatened in 1996. In the Santa Monica Mountains, historical records indicate that the red-legged frog was abundant in most of the watershed's major streams, including Malibu, Topanga, Solstice, Cold, and Trancas Creeks (See [Figure 3.1-1](#)). Until biologists discovered a small population in the Simi Hills in the late 1990s, the last known red-legged frog recorded in the Santa Monica Bay watershed was in Cold Creek in 1975. The Simi Hills population is

Photograph of a California red-legged frog. Photo Credit: Katy Delany, National Park Service.

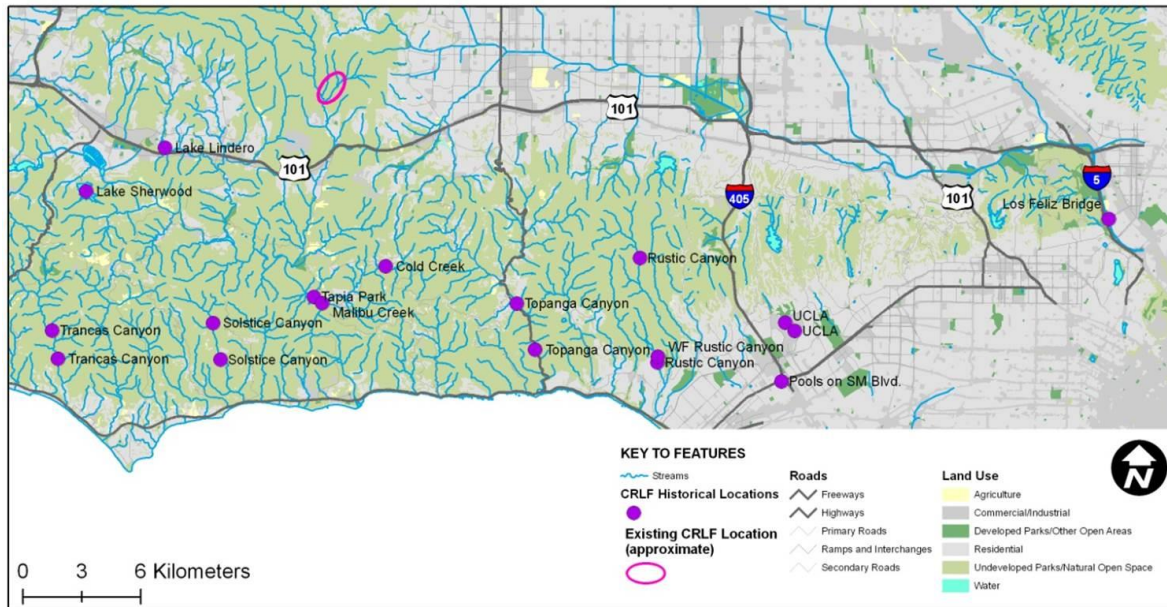


¹ Santa Monica Bay Restoration Commission

BIODIVERSITY: Red-Legged Frog Recovery

the only population of red-legged frog known to exist in the Santa Monica Bay watershed.

Figure 3.1-1. Map of the historical distribution of the California red-legged frog. Credit: National Park Service



Most of the factors impacting global amphibian populations have played a role in the decline of the red-legged frog in the Santa Monica Mountains, with loss of habitat and the introduction of invasive species such as Louisiana red swamp crayfish (*Procambarus clarkii*), and particularly bullfrogs (*Rana catesbeiana*), likely playing major roles. Bullfrogs were introduced in California during California's gold rush and into the early 1900s, likely to replace the over-harvested red-legged frogs as a source of food. According to researchers, tens of thousands of red-legged frogs were harvested yearly during that period (Jennings and Hayes 1985). To supply the demand for frog legs, bullfrogs were eventually imported from the east coast. The much larger bullfrog is the largest frog in North America and is a "gape-limited" predator, eating just about anything that will fit in its mouth, including mammals, birds, reptiles, and other amphibians. Moyle (1973) proposed that the decline in the red-legged frog population was due "largely to the competition and predation of introduction of bullfrogs."

In an effort to stave off the local extinction of the red-legged frog, in 2010 the Santa Monica Bay National Estuary Program (SMBNEP) funded the National Park Service (NPS) and the State Department of Parks and Recreation to conduct surveys in the northern Santa Monica Bay watershed to identify and assess suitable habitat for reintroduction of the red-legged frog in the Santa Monica Mountains.

Led by NPS Wildlife Ecologist Katy Delaney, experts surveyed more than 30 streams in the Santa Monica Mountains; seven streams were identified as meeting the

BIODIVERSITY: Red-Legged Frog Recovery

requirements for successful reintroduction. Sites were evaluated on a number of criteria, including: available cover, water persistence, depth, temperature, available upland habitat, historical presence, and the absence of invasive predators, especially bullfrogs and crayfish. Additionally, SMBNEP staff conducted monitoring at all seven potential relocation sites to ensure that water quality was adequate to support the red-legged frog. By late 2013, two streams were selected for the initial relocation, and all necessary permits had been secured.

Geographic proximity, and a hydrologic connection between the Simi Hills and the Santa Monica Mountains, led Delaney's team to conclude that the Simi Hills population was likely genetically similar to the original Santa Monica Mountains population of the early 20th century. This population was chosen as the source for the relocation project.

In early 2014, NPS personnel built mesh fabric pens to protect the frog eggs from predators, and then pre-placed them at the selected relocation sites. This allowed time for algae to grow on the mesh and provide a food source for any newly hatched tadpoles. United States Geological Survey and NPS biologists collected clusters of eggs from the Simi Hills site and transported them to the two selected streams.

Biologists from National Park Service and United States Geological Survey collecting egg masses for translocation. *Photo Credit: National Park Service*



BIODIVERSITY: Red-Legged Frog Recovery

At the relocation sites, eggs were placed in small mesh bags and attached to the tops of the pens. This configuration mimicked the natural position of red-legged frog egg masses in the wild. In addition to the algae growing on the pens, NPS biologists provided organic greens for supplemental nutrition as necessary. Within 10 days after relocation, all the egg masses had hatched and newly hatched tadpoles could move in and out of the mesh bags freely. After about a week, the bags were opened to release any tadpoles that were too large to escape the smaller bags into the larger enclosures. Additional pens were added to prevent overcrowding as the eggs hatched and tadpoles grew.

By late August of 2014, Delaney had counted 24 metamorphs (the transformation from tadpole to true frog) during a single visit to one of the sites. At the second site, biologists noted that many tadpoles had developed front feet and long tails, with many showing well developed back legs. Since mid-February 2015, Delaney's team has been finding juvenile red-legged frogs at both sites during twice-weekly visits. NPS will continue to monitor the sites and Delaney hopes that soon there will be adult, breeding-age frogs at both the relocation sites.

Future plans include relocating the red-legged frog to two new sites, and relocating additional eggs to the current sites. NPS will also continue monitoring the Simi Hills population to assure the sustainability of the site as a source of future relocations. Additionally, a local group, Mountains Restoration Trust, is working to manage crayfish in the area through trapping.

Although the red-legged frog still faces many threats such as drought, climate change, urban encroachment, invasive predators, and environmental contaminants, for now, after four decades, the recently named State Amphibian, the "Celebrated Jumping Frog of Calaveras County" has returned to the Santa Monica Mountains.

Acknowledgements

Thanks to the project leader, National Park Service Wildlife Ecologist Katy Delaney for her valuable feedback on this story and her dedication to the recovery of the California red-legged frog.

References

- AmphibiaWeb (2015). Information on amphibian biology and conservation [web application]. Berkeley, California. <<http://amphibiaweb.org/>>. AmphibiaWeb Copyright © 2000-2015. The Regents of the University of California Federal Register, Vol. 61, No. 101. Thursday, May 23, 1996. Pp. 25813-25833.
- Jennings, M.R. and M.P. Hayes (1985). "Pre-1900 overharvest of California red-legged frogs (*Rana aurora draytonii*): The inducement for bullfrog (*Rana catesbeiana*) introduction." *Herpetologica* 41:94–103.
- Moyle, P. (1973). "Effects of introduced bullfrogs, *Rana catesbeiana*, on the native frogs of the San Joaquin Valley, California." *Copeia* 1973:18–22.