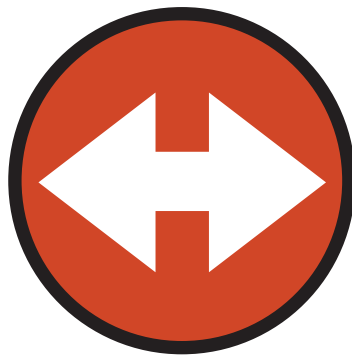


FOOTHILL YELLOW- LEGGED FROG

Rana boylei



**Condition: Significant
Concern**

Trend: Stable

Confidence: Low



WHY IS THIS RESOURCE INCLUDED?

Foothill yellow-legged frogs are good indicators of both perennial and ephemeral stream conditions because they rely on lotic environments for breeding and post-metamorphic habitat. Early life stages are sensitive to streamflow fluctuations, changes in water temperature, and are vulnerable to both recreational use and invasive aquatic species. This species is also considered vulnerable to climate change because of its sensitivities to temperature and precipitation levels.

OVERALL STATUS

The foothill yellow-legged frog's range includes streams from Oregon to Los Angeles County, California, including at elevations up to 6,300 feet in the Sierra Nevadas. This species has declined over half of their historical range, including a severe drop in numbers in the San Francisco Bay Area. As a result, the foothill yellow-legged frog is designated as a Federal species of concern, a Forest Service sensitive species, and a California species of special concern. Museum specimens and California Natural Diversity Database (CNDDDB) records reveal foothill yellow-legged frogs lived at Rock Spring Meadow, Redwood Creek, and Cataract Creek well into the middle of the twentieth century. There are currently two populations on MMWD lands: Little Carson Creek and Big Carson Creek, both tributaries to Kent Lake.

A review of historic records, museum specimens, and CNDDDB records, combined with focused field surveys, indicate that both the foothill yellow-legged frog's range and numbers have declined significantly in Marin County and in the One Tam area of focus over the last 75 years. Breeding surveys conducted by MMWD between 2004 and the present indicate the remaining breeding populations have been relatively stable, but they are vulnerable to decline due to their small size and isolation from other foothill yellow-legged frog populations. Although the aggregation of the condition scores for the metrics below yield a borderline Caution/Significant Concern rating, we felt that this high level of vulnerability warranted an overall condition of Significant Concern.

DESIRED CONDITIONS

- Continued presence of all life stages in currently occupied streams (Big and Little Carson creeks) with stable or increasing number of egg masses and individual adults detected each year
- Re-establishment of breeding populations in historically occupied streams including Cataract and Redwood creeks
- Improved breeding habitat quality, including sunny openings above breeding pools, reduction in human-caused impacts to creek bottoms/cobble in and adjacent to breeding pools, and continued management of non-native predators

STRESSORS

Predation: Foothill yellow-legged frogs are vulnerable to predation by invasive bullfrogs (*R. catesbiana*) and signal crayfish (*Pacifastacus leniusculus*), as well as native rough-skinned newts (*Taricha granulosa*).

In-stream Habitat Disturbance: During the breeding season (February through May), foothill yellow-legged frogs congregate in sunny pools where the water is warm and well aerated to deposit egg masses among cobbles and gravel. Eggs and tadpoles are highly vulnerable to in-stream disturbances that shift or compact both large and small rocks. Disturbance and loss of egg masses and breeding habitat can occur as a result of very high flow events as well as in-stream recreational and maintenance activities.



Shading: The absence of gaps in the riparian canopy can deprive frogs of the sunny areas they prefer.

Disease: Chytrid fungus (*Batrachochytrium dendrobatidis*) causes a potentially lethal disease in amphibians called chytridiomycosis, which has caused amphibian population declines worldwide. Chytrid fungus is present on Mt. Tam, but so far it does not seem to be affecting foothill yellow-legged frogs.

Potential Inbreeding: Small, isolated populations of foothill yellow-legged frogs may be vulnerable inbreeding, which could negatively affect their health. While the Big Carson and Little Carson populations have sufficiently suitable upland habitat to allow them to interbreed with each other, the next nearest historic populations have been extirpated. The introduction of new genetic material from populations elsewhere in Marin County or beyond is likely to be a rare event.

Climate Change: Foothill yellow-legged frogs are vulnerable to extreme temperature and flow fluctuations, both of which may occur under future climate change scenarios.

METRICS USED TO MEASURE HEALTH

Metric	Condition Goal(s)	Status
<p>Metric 1 Species presence in suitable streams or historically occupied streams (proportion of sites occupied)</p>	Re-establish breeding populations within 100% of streams with suitable habitat	
<p>Metric 2 Number of egg masses observed during breeding surveys</p>	<ul style="list-style-type: none"> Maintain a five-year running average of no less than 24 egg masses observed in Big Carson Creek, its tributaries, and little Carson Creek combined Establish self-sustaining breeding populations of foothill yellow-legged frogs, as evidenced by observations of 10 or more egg masses per creek per year for a minimum of three years in a row, in habitat deemed suitable based on past occurrences and current and projected habitat conditions 	

Metric 3

Percent of egg masses observed to successfully incubate

- More than 94% of egg masses reach maturation each year
- No egg masses are lost due to in-stream disturbance caused by maintenance work or recreational activities



INFORMATION GAPS

Population Viability Analysis: Twelve years of consistent surveys in Big Carson Creek, its tributaries, and Little Carson Creek now provide time series data pertaining to foothill yellow-legged frogs at life stages from egg mass through breeding adult. There is sufficient data available for the development of a simplistic population model and viability analysis which would help land managers better refine recovery targets for reintroduction efforts in Redwood and Cataract creeks.

Range: Individual frogs can be identified by the unique pattern of markings on each frog's chin, enabling researchers to maintain annual records on individual frog's vigor, reproductive state, and location. Chin pattern analysis combined with mark and recapture studies indicate that there is very little movement between frogs at Big Carson and Little Carson creeks, suggesting that dispersal and gene flow between the two locations is limited. However, the potential range for individual frogs is not known, which limits land managers' ability to identify steps to enhance gene flow and dispersal.

Habitat Requirements: While the habitat conditions in breeding pools needed for successful egg laying and tadpole maturation are reasonably well understood, less is known about foothill yellow-legged frog requirements at other life stages or for movement from one breeding site to another.