Foothill Yellow-Legged Frog (*Rana boylii*)

Status

State: Species of Concern
Federal: None

Population Trend

Global: Declining
State: Declining
Within Inventory Area: Unknown

Data Characterization

The location database for the foothill yellow-legged frog (*Rana boylii)* within its known range in California includes 288 occurrence records dated from 1958 to 2001. None was documented for the inventory area, but Jennings and Hayes (1994) show 11 occurrence records of foothill yellow-legged frog in Contra Costa County. Eight of these populations are believed to be extinct. The 3 remaining records are concentrated in the Mount Diablo region.

A moderate amount of literature is available for the foothill yellow-legged frog because of its local availability for study and the recent trend in global decline in amphibians. Most of the literature pertains to habitat requirements, population trends, ecological relationships, threats, and conservation efforts.

Range

Historically, foothill yellow-legged frogs occurred from west of the crest of the Cascade Mountains in Oregon south to the Transverse Ranges in Los Angeles County, and in the Sierra Nevada foothills south to Kern County (Zweifel 1955; Stebbins 1985). An isolated population was reported in Sierra San Pedro Martir, Baja Mexico (Loomis 1965). The current range excludes coastal areas south of northern San Luis Obispo County and foothill areas south of Fresno County where the species is apparently extirpated (Jennings and Hayes 1994). Its known elevation range extends from near sea level to approximately 2,040 meters above sea level (Stebbins 1985).

Occurrences within the ECCC HCP/NCCP Inventory Area

Foothill yellow-legged frogs occur in numerous perennial streams throughout the inventory area. As described above, there 11 documented occurrence records of foothill yellow-legged frog in Contra Costa County—8 believed to be extinct and 3 concentrated in the Mount Diablo region.

Biology

Habitat

Foothill yellow-legged frogs require shallow, flowing water in small to moderate-sized streams with at least some cobble-sized substrate (Hayes and Jennings 1988, Jennings 1988). This habitat is believed to favor oviposition (Storer 1925, Fitch 1936, Zweifel 1955) and refuge habitat for larvae and postmetamorphs (Hayes and Jennings 1988, Jennings 1988). This species has been found in streams without cobble (Fitch 1938, Zweifel 1955), but it is not clear whether these habitats are regularly used (Hayes and Jennings 1988, Jennings and Hayes 1994). Foothill yellow-legged frogs are usually absent from habitats where introduced aquatic predators, such as various fishes and bullfrogs, are present (Hayes and Jennings 1986, 1988; Kupferberg 1994). The species deposits its egg masses on the downstream side of cobbles and boulders over which a relatively thin, gentle flow of water exists (Storer 1925, Fitch 1936, Zweifel 1955). The timing of oviposition typically follows the period of high flow discharge from winter rainfall and snowmelt (Jennings and Hayes 1994). The embryos have a critical thermal maximum temperature or 26ºC (Zweifel 1955).

Foraging Requirements

Adult foothill yellow-legged frogs feed primarily on both aquatic and terrestrial insects (Fitch 1936); tadpoles preferentially graze on algae (Jennings and Hayes 1994). Postmetamorphs eat aquatic and terrestrial insects (Storer 1925, Fitch 1936).

Reproduction

Foothill yellow-legged frogs in California generally breed between March and early June (Storer 1925, Grinnell et al. 1930, Wright and Wright 1949, Jennings and Hayes 1994). Masses of eggs are deposited on the downstream side of cobbles and boulders. After oviposition, a minimum of approximately 15 weeks is required to reach metamorphosis, which typically occurs between July and September (Storer 1925, Jennings 1988). Larvae attain adult size in 2 years (Storer 1925).

Demography

Masses of 300 to 1,200 eggs are deposited during oviposition by each breeding female. Juvenile and adult survivorship is unknown. Adult longevity is unknown.

Ecological Relationships

Garter snakes are considered one of the most prominent predators of foothill yellow-legged frog tadpoles (Fitch 1941, Zweifel 1955, Lind 1990, Jennings and Hayes 1994). Salamanders, including the rough-skinned newt (*Taricha tarosa*), are believed to prey on the species' eggs.

Threats

Habitat loss and degradation, introduction of exotic predators, and toxic chemicals (including pesticides) pose continued and increasing threats to the long-term viability amphibians throughout California (Jennings and Hayes 1994). In addition, poorly timed water releases from upstream reservoirs can scour egg masses of this species from their oviposition substrates (Jennings and Hayes 1994), and decreased flows can force adult frogs to move into permanent pools, where they may be more susceptible to predation (Hayes and Jennings 1988)

Conservation and Management

The principal conservation measures necessary for maintaining viable populations of this species include habitat preservation, restoration, and management to retain ecological conditions necessary for survival and population growth. However, information on the range of ecological conditions that can be tolerated by this species is limited. Studies on the habitat requirements of the foothill yellow-legged frog larvae and early postmetamorphic states are urgently needed (Jennings and Hayes 1994). An understanding of the variation in flow and shear conditions that egg masses and larvae will tolerate is needed, as well as a more precise understanding of the critical thermal maxima of the embryonic stages (Jennings and Hayes 1994). In managed streams, Jennings and Hayes (1994) recommend avoiding water releases that create excess flow and shear conditions when egg masses and the more-fragile younger larval stages are present.

Modeled Species Distribution

Model Description

Model Assumptions

Core Habitat: Perennial streams in riparian woodland/scrub, grassland, oak savanna, and oak woodland land cover types.

Low-use habitat: Other streams in riparian woodland/scrub, grassland, oak savanna, and oak woodland land cover types.

Rationale

Foothill yellow-legged frogs are stream-dwelling amphibians that require shallow, flowing water in small to moderate-sized perennial streams with at least some cobble-sized substrate (Hayes and Jennings 1988, Jennings 1988). This species has also been found in perennial streams without cobble (Fitch 1938, Zweifel 1955), but it is not clear whether these habitats are regularly used (Hayes and Jennings 1988, Jennings and Hayes 1994).

Model Results

Figure 2 shows the modeled potential habitat of the foothill yellow-legged frog within the inventory area. Suitable breeding habitat appears to be present in six distinct areas in the inventory area that maintain perennial stream flows and pass through suitable land-cover types:

- Upper Marsh Creek upstream of Round Valley Regional Park and the Los Vaqueros Watershed;
- A small section of lower Marsh Creek below Marsh Creek Reservoir;
- Kellogg Creek downstream of the Los Vaqueros Dam;
- Lower Sand Creek just before it becomes a constructed early channel;
- Tributaries to Mount Diablo Creek in Clayton: Mitchell Creek, Donner Creek, and an unnamed tributary; and
- Lower Kirker Creek in Pittsburg.

The small section of lower Marsh Creek is likely perennial due to agricultural runoff and may not provide suitable habitat for foothill yellow-legged frog. Kellogg Creek has become perennial below the Los Vaqueros Dam since the construction of Los Vaqueros Reservoir; future releases below the dam are uncertain. It is unlikely that lower Kirker Creek provides suitable breeding habitat for foothill yellow-legged frog because the reach is surrounded by dense urban development. Thus, the only stable and naturally-occurring potential habitat for the species occurs in upper Marsh Creek, lower Sand Creek, tributaries to Mount Diablo Creek in Clayton. Most other stream reaches above the urban and agricultural lowlands are shown as potential low use habitat. There are no documented occurrences of foothill yellow-legged frogs in the inventory area but the species is expected to occur in suitable habitat.

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