Foothill Yellow-legged Frog Surveys and California Red-legged Frog Protocol Surveys 2003

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1.0 Summary

Surveys for foothill yellow-legged frog (*Rana boylii*) and protocol surveys for California red-legged frog (*Rana aurora draytonii*) were conducted from April to September 2003 by Garcia and Associates (GANDA) within the Marin Municipal Water District's (MMWD) Mt. Tamalpais watershed, Marin County, California. Foothill yellow-legged frog is a California species of special concern. California red-legged frog is a federally-listed threatened species and a California species of special concern. GANDA conducted daytime surveys for foothill yellow-legged frog at Swede George Creek, the East Fork of Swede George Creek, Van Wyck Creek, Barth's Creek, Cataract Creek, and the West, Middle, and East forks of Lagunitas Creek during April 2003. Protocol surveys for California red-legged frog were conducted between June and September 2003 at: Bon Tempe Creek from the seasonal pond called "Frog Pond" downstream to Alpine Lake, Phoenix Lake, including Phoenix Creek upstream of Phoenix Lake, and Lake Lagunitas. No frogs of either species were encountered during the surveys.

2.0 Introduction

In 2002, GANDA conducted a habitat characterization for special status amphibians and aquatic reptiles, and surveys for foothill yellow-legged frog and California red-legged frog (GANDA 2002). During the Mt. Tamalpais anuran habitat characterization of 2002, GANDA identified several creeks with potential habitat for foothill yellow-legged frogs and that were considered high priority for surveying because of nearby human disturbance (e.g., trails). These sites have not been previously surveyed. Also, GANDA recommended additional surveys for foothill yellow-legged frogs at Cataract Creek, where frogs were encountered most recently in 1993 (CDFG 2003). Based on the 2002 surveys, sites proposed for foothill yellow-legged frog surveys included Swede George Creek, the East Fork of Swede George Creek, Van Wyck Creek, Barth's Creek, Cataract Creek, and West, Middle, and East forks of Lagunitas Creek.

The habitat characterization of 2002 (GANDA 2002) identified three other potential sites for California red-legged frog. At those sites, protocol surveys (USFWS 1997) were recommended. The potential sites for California red-legged frogs included Bon Tempe Creek and the adjoining cove at Alpine Lake, Phoenix Lake and adjacent section of Phoenix Creek, and Lake Lagunitas.

In 2003, GANDA was contracted by the MMWD to conduct recommended surveys for foothill yellow-legged frog and the federally-threatened California red-legged frog at the sites mentioned above.

3.0 Methods

3.1 Literature and Data Review

Several information sources on foothill yellow-legged frog and California red-legged frog were reviewed, including the California Natural Diversity Database (CDGG 2003), *A Field Guide to Western Reptiles and Amphibians* (Stebbins 2003), and other studies on California amphibians

(Jennings and Hayes 1994; Hayes and Jennings 1986). Major museum collection databases (California Academy of Sciences, Santa Barbara Natural History Museum, and San Diego Natural History Museum) were consulted for voucher specimens from Marin County.

3.2 Foothill Yellow-legged Frog Surveys

GANDA herpetologist, Pierre Fidenci, conducted surveys for foothill yellow-legged frogs from April 7 to 23, 2003 at the following sites within the Mt. Tamalpais watershed:

1) Swede George Creek at the intersection with Helen Markt Trail, 100 meters upstream and downstream of the bridge;
2) East Fork of Swede George Creek where good habitat exists between Willow Meadow and Azalea Meadow;
3) Van Wyck Creek along the low gradient section parallel to Rocky Ridge Road;
4) Barth's Creek from Cataract Creek up to 600 meters upstream;
5) Cataract Creek from Alpine Lake to Rock Spring; and
6) The West, Middle, and East forks of Lagunitas Creek between Lake Lagunitas and 100 meters upstream of Lake Lagunitas Road.

Surveys for foothill yellow-legged frog were conducted according to the protocol outlined in Fellers and Freel (1985). Surveys were conducted using binoculars to scan for frogs, and by slowly walking in the water or on adjacent banks to search for eggs, larvae, and adults. The entire shore of the creek was visually scanned during the surveys. GANDA's herpetologist took care to avoid disturbing sediments, vegetation, and any visible larvae. All detections of sensitive, listed, and common herpetofauna species observed during surveys were recorded. Weather conditions (air temperature and wind speed), and water temperature at 5 cm depth were recorded. Fish presence was also recorded because of their potential indirect or direct effects on foothill yellow-legged frog populations.

To reduce the spread of disease agents and parasites between study sites that affect amphibians, GANDA's herpetologist followed the Code of Practice, as prepared by the Declining Amphibian Populations Task Force (DAPTF 1998). After surveying each site, field equipment, including boots and sampling nets, was rinsed with sterilized water (i.e., boiled or treated) and then scrubbed with 70% ethanol solution and rinsed clean with sterilized water.

3.3 California Red-legged Frog Surveys

The survey protocol followed guidelines established by the U.S. Fish and Wildlife Service (USFWS 1997). GANDA herpetologist, Pierre Fidenci, conducted two daytime and two nighttime surveys at three sites: (1) Bon Tempe Creek from the seasonal pond called "Frog Pond" downstream to Alpine Lake and including the narrow channel area at the mouth of Bon Tempe Creek; (2) Phoenix Lake and Phoenix Creek upstream of Phoenix Lake where there is adequate habitat; and (4) Lake Lagunitas. During the nighttime surveys, GANDA's herpetologist was accompanied by MMWD biologists Gregory Andrew or Eric Ettlinger.

At least 24 hours elapsed before repeating surveys at the same site. Daytime surveys were conducted from July 18 to August 29, 2003 between 0830 and 1800 hrs. Nighttime surveys were conducted from July 2 to September 4, 2003 between 2100 and 2345 hrs. Night surveys were conducted using binoculars and a 6 volt flashlight. A combination of visual (eyeshine detection) and auditory methods were used to detect frogs. In cases where no view was available, the vegetation was parted to uncover hidden pools. Care was used while walking to avoid disturbing sediment, vegetation, and potential amphibian larvae.

4.0 Results and Discussion

4.1 Occurrence of Foothill Yellow-legged Frog and California red-legged Frog within the Mt. Tamalpais Watershed.

The CNDDB (CDFG 2003) documents two occurrences of foothill yellow-legged frog within the Mt. Tamalpais watershed: at Cataract Creek, about 1,000 meters south of Alpine Lake; and at Lagunitas Creek, 400 meters north of Peters Dam (Kent Lake). The frogs were observed at both sites by Gerstung in the spring of 1993 and assessed to be abundant. The museum collection database documents one foothill yellow-legged frog occurrence in the Mt. Tamalpais Watershed near Middle Peak, 1,400 meters south of Lagunitas Lake. The voucher specimen was captured in 1928 by W. Bittel. The location attributed to the voucher specimen remains questionable. Indeed, the UTM coordinates locate the specimen at Middle Peak where no water body exists. The nearest water bodies to this location are the Middle Fork of Lagunitas Creek and the West Fork of Fern Creek. During the 2002 frog surveys, GANDA (2002) observed foothill yellow-legged frog at Big Carson Creek, Little Carson Creek, tributary to Little Carson Creek, and Lagunitas Creek. One sub-adult and one adult were found a few meters upstream and downstream from Little Carson Trail on Little Carson Creek. Five adults were observed in Big Carson Creek a few meters downstream from Meilliard Camp Trail. One juvenile was found on a tributary to Little Carson Creek about 3 meters upstream from Kent Pump Road. Finally, one adult was found in Lagunitas Creek West Fork a few meters upstream from Lakeside Road.

The closest known occurrences of California red-legged frogs are located in two ponds along the Bolinas Ridge located about 14 km from the closest potential breeding sites in the Mt. Tamalpais Watershed. These occurences are isolated from the Mt. Tamalpais watershed by the Bolinas Ridge.

4.2 Survey Results

Weather conditions were favorable for conducting frog surveys. During foothill yellow-legged frog daytime surveys, air temperatures ranged from 13°C to 21°C; water temperatures at 5 cm depth ranged from 9°C to 11°C, with winds from 0 to 3 m/s.

During California red-legged frog protocol surveys, daytime air temperatures ranged from 22°C to 30°C; water temperatures at 5 cm depth ranged from 21°C to 24°C, with winds from 0 to 4.5 m/s. Nighttime air temperatures ranged from 19°C to 22°C; water temperatures at 5 cm depth

ranged from 22°C to 26°C, with winds from 0 to 7 m/s. No rain occurred during or between the surveys.

No foothill yellow-legged frogs or California red-legged frogs were observed during the 2003 surveys. At Cataract Creek, the foothill yellow-legged frog population that was considered to be abundant 10 years ago (CDFG 2003) appears now to be extirpated. At the west fork of Lagunitas Creek, one adult foothill yellow-legged frog was observed in the spring of 2002 (GANDA 2002). During the surveys of 2003, no foothill yellow-legged frogs were found along the west fork of Lagunitas Creek. Even though suitable habitat exists along the creek, it is believed that the frog observed in 2003 was a solitary individual. Based on the survey results of 2003, it is likely that the west fork of Lagunitas Creek does not support a viable population of foothill yellow-legged frogs. Also, the potential presence of adult bullfrogs along the west fork of Lagunitas Creek, as suggested with the observation of one individual in the spring of 2003, could pose a threat to foothill yellow-legged frog. It is likely that bullfrogs could temporarily use the west fork of Lagunitas Creek. A source population of bullfrogs is located at Lake Lagunitas, where a large number of bullfrogs were observed in 2003.

During the protocol surveys for California red-legged frogs in 2003, a large number of bullfrogs were encountered at Alpine Lake-Bon Tempe Creek, Lake Lagunitas, and Phoenix Lake. Most of these were last stage tadpoles and juveniles due to the timing of surveys. Even though good quality habitat exists at those sites, the high abundance of bullfrogs would likely preclude the presence of viable populations of California red-legged frogs. Based on GANDA's protocol survey results on both 2002 and 2003, California red-legged frogs are very likely to be absent within the Mt. Tamalpais watershed. The closest known occurrences of California red-legged frogs are located in two ponds along the Bolinas Ridge located about 14 km from the closest potential breeding sites in the Mt. Tamalpais Watershed (i.e., Hidden Lake). The steep slope separating the Bolinas Ridge sites from the potential sites in the Mt. Tamalpais watershed would likely preclude dispersal of California red-legged frogs to these areas.

4.3 Herpetofauna Encountered

The following amphibian and aquatic reptile species were observed during the surveys: rough-skinned newt (*Taricha granulosa*), California newt (*Taricha torosa*), California giant salamander (*Dicamptodon ensatus*), Pacific treefrog (*Hyla regilla*), bullfrog (*Rana catesbeiana*), western terrestrial garter snake (*Thamnophis elegans*), and western pond turtle (*Clemmys marmorata*). GANDA also conducted a population study for western pond turtle in 2003, which is described in a separate report.

5.0 Conclusions

Currently, extant population(s) of the foothill yellow-legged frogs appear to be located mostly on the north side of the Mt. Tamalpais watershed, north of Alpine Lake. Known populations within the Mt. Tamalpais are found along Big Carson Creek, Little Carson Creek, and its tributary (GANDA 2002). Foothill yellow-legged frogs that were once present in the south part of the watershed, for example at Cataract Creek, are now in decline or more likely extirpated. Human made barriers (e.g., dams, roads, trails) appear to preclude frog recolonization from north to

south of Alpine Lake. Before the construction of Alpine Dam, foothill yellow-legged frogs could disperse using Lagunitas Creek and Cataract Creek. Both creeks are potential corridors and suitable habitat for frogs within the Mt. Tamalpais watershed. The foothill yellow-legged frog population was apparently abundant 10 years ago (CDFG 2003); now, this population appears to have been extirpated.

Habitat destruction and alteration is considered to be the most significant threat to stream-breeding amphibians. Based on survey results and other studies (Semlitsch 2003), it is possible that the decline of foothill yellow-legged frogs is correlated with recreation within the Mt. Tamalpais watershed. Foothill yellow-legged frog populations are still encountered in areas with low to no human impact (e.g., Little Carson Creek). Suitable habitats (e.g., Cataract Creek), where foothill yellow-legged populations are apparently extirpated, experience much higher human impact such as higher use of trails and proximity of trails to creeks. In general, recreation is believed to play a major role in the decline of foothill yellow-legged frog within the watershed. Other threats could play a role in local anuran decline. Introduced species, as either predators or competitors, could threaten the survival of foothill yellow-legged frog within the watershed. Non-native species such as bass (*Micropterus sp*.), crayfish (*Procambarus sp.*), and bullfrog have been implicated in decline of native frogs. However, very few bullfrogs (just one adult) were observed along creeks that offer suitable habitat for foothill yellow-legged frog. Also, the lack of bullfrogs where foothill-yellow legged frogs appear to now be extirpated indicates that bullfrogs are not likely to be the main cause of native frog decline within the Mt. Tamalpais watershed. The population trend of the remaining populations for foothill yellow-legged frog within the watershed is unknown. However, it appears that some populations within the watershed have been extirpated from key habitats. Therefore, population monitoring of the known remaining populations would be useful to identify populations at risk and help prevent further extirpation.

The steep slope separating the Bolinas Ridge California red-legged frog sites from the potential sites in the Mt. Tamalpais watershed would likely preclude dispersal of California red-legged frogs to these areas. Based on the 2002 and 2003 survey results, no further surveys are needed and California red-legged frogs are very likely to be absent in the Mt. Tamalpais watershed.

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Appendix A

California Red-legged Frog Protocol Survey Data Forms

The California red-legged frog protocol survey data forms are included as Appendix A of the hard copies of this report provided to the Marin Municipal Water District.