Foothill Yellow-Legged Frog (*Rana boylii*)

Habitat Assessment and Survey

At

Clover Valley

Placer County, California

July 2006

Prepared for:

RANEY PLANNING & MANAGEMENT, INC.

INTRODUCTION

At the request of Raney Planning and Management, Inc., ECORP Consulting, Inc. (ECORP) conducted a habitat assessment and visual encounter survey for foothill yellow-legged frog (FYLF; *Rana boylii*) within Clover Valley. The 627±-acre project site is situated within an elevation range of about 91 to 183 m (300 to 600 ft) above mean sea level, and is located approximately 3 km (1.9 mi) east of the Town of Loomis (Figure 1 – *Project Site and Vicinity Map*). The site corresponds to portions of Sections 5, 6, 7 and 8 Township 11 North, Range 7 East, and Sections 31 and 32 Township 12 North and Range 7 East (MDBM) of the "Rocklin" 7.5-minute quadrangle (U.S. Department of the Interior, Geological Survey 1981). The approximate center of the site is located at 38° 50′ 10″ North and 121° 13′ 30″ West within the Lower Sacramento River Watershed (#18020109, U.S. Department of Interior, Geological Survey 1978).

Environmental Setting

The Project area is characterized by a flat alluvial valley with relatively steeply sloped valley walls. Annual grassland comprises the dominant upland plant community in the valley; whereas, foothill hardwood and shrub communities are present along the sloping valley walls. The annual grassland is dominated by non-native grasses including medusahead grass (*Taeniatherum caput-medusae*), ryegrass (*Lolium multiflorum*), wild oat (*Avena fatua*), soft chess (*Bromus hordeaceus*), and ripgut brome (*B. diandrus*). Herbaceous plants in the annual grassland community include filaree (*Erodium, sp.*) and star thistle (*Centaurea solsicialis*).

The riparian corridor along Clover Valley Creek supports valley oak (*Q. lobata*), willows (*Salix goodingii, S hindsiana, S. laevigata, and S. lasiolepis*), white alder (*Alnus rhombifolia*), cottonwood (*Populus fremontii*), walnut (*Juglans nigra*), wild grape (*Vitis californica*) and Himalaya blackberry (*Rubus armeniacus*).

Foothill Yellow-Legged Frog Natural History

Status - The FYLF is a California State Species of Special Concern, and a U.S. Forest Service and Bureau of Land Management Sensitive Species.

Distribution - Historically, FYLFs were found in the Coast Ranges from the Santiam River drainage in Oregon (Mehama and Marion counties) to the San Gabriel River drainage in California (Los Angeles county), and along the west slopes of the Sierra Nevada/Cascade crest in most of central and northern California (Storer 1925, Zweifel 1955). The elevation range extends from sea level to 1,550 m (5,000 ft) in the Sierra Nevada. However, specimens catalogued at the University of California Museum of Vertebrate Zoology (MVZ 35914-18) show that this species has been recorded at elevations as high as 1,830 m (6,000 ft) in Plumas County (Zweifel 1955). This species has disappeared from about 45 percent of its historic range throughout California, and 66 percent of its historic range in the Sierra Nevada (Jennings and Hayes 1994). Livezey (1963) reported an isolated population in San Joaquin County on the floor of the Central Valley.

General Life History - The FYLF is a small [3.7 – 7.1 cm (1.5 – 2.8 in)], highly aquatic frog that occurs almost exclusively in shallow, flowing streams with cobble substrates at elevations below 1,830 m (6,000 ft) (Stebbins 1985, Jennings and Hayes 1994). The skin on the dorsal surface has a distinct granular appearance and a pale triangle is often apparent on its snout. The yellow coloration on the ventral surface is confined to the rear legs.

Adult FYLFs are primarily diurnal with high site fidelity and typically occupy home ranges less than 10 m (33 ft) in diameter (Van Wagner 1996); however, they will move greater distances to breed. FYLFs can be active all year in warmer locations, but may become inactive or hibernate in colder climates. At lower elevations, FYLF likely spend most of the year in or near streams. Nussbaum et al. (1983) found FYLFs underground and beneath surface objects more than 50 m (165 ft) from water in April. Significant seasonal movements or migrations from breeding areas have not been reported. However, from April through June, adults and subadults may move several hundred meters or more, to congregate at breeding sites. Adult frogs, primarily males, will congregate along main stem rivers during spring to breed. However, adults do not

typically remain in these areas during summer, returning instead to basking and foraging sites on tributaries, or retreating to cooler microhabitats along shaded river sections (Seltenrich and Pool 2002). They may also decrease diurnal activity during the hottest part of the summer. Zweifel (1955) noted that younger individuals typically remained by the stream until late fall and appeared earlier in the spring than adults.

Juvenile FYLFs have shown a strong tendency to initiate upstream migrations in late summer and early fall (Ashton et al. 1998, Twitty et al. 1967) similar to the compensating mechanism displayed by stream insects subject to downstream drift (Jennings and Hayes 1994). These movements are often correlated with the presence of upstream tributaries containing suitable habitat for FYLFs, and it is speculated that this may be an evolutionarily mechanism this species has developed to repatriate larvae that may have been washed downstream (Ashton et al. 1998).

Sexual maturity generally occurs in 1 to 2 years for males and 2 years for females. Prior to the onset of breeding, adult frogs begin to appear along stream margins, especially on warm sunny days. As flows diminish and water temperatures begin to increase, males are usually the first to begin moving back to breeding areas to establish calling stations. Females arrive later when average air temperatures increase, stream flows decrease, and water temperatures reach 12 to 15°C (Seltenrich and Pool 2002). Breeding tends to take place in the same general area each year, unless stream conditions change and the habitat is no longer suitable for breeding. Oviposition typically occurs between late March and early June (Storer 1925, Grinnell et al. 1930, Wright and Wright 1949), which usually follows periods of high-flow discharges associated with winter rainfall and snowmelt. FYLF oviposition has previously been thought to be completed within a two week period (Storer 1925, Zweifel 1955, Nussbaum et al. 1983, Stebbins 1985, Jennings 1988); however, studies on Coastal streams (Kupferberg 1996, Lind et al. 1996) and Sierra Nevada streams (Pacific Gas and Electric Company 2001, 2002a, 2002b) have revealed that breeding may extend over a longer period of time. Females deposit eggs in clusters of 300 to 1,200, and are typically attached to the side or underside of cobbles and boulders in areas of low-moderate flow (Storer 1925, Fitch 1936, Zweifel 1955). Eggs generally hatch in 15 to 30

days (depending on water temperature), and tadpoles metamorphose into juvenile frogs in three to four months (depending on water temperature and food availability). During the early stages of development, tadpoles are herbivorous, feeding on diatoms and other algae (Kupferberg 1996), and as they mature will opportunistically feed on the necrotic tissue of dead tadpoles or macrofauna, if available (Ashton et al. 1998). After metamorphosis, the diet of juvenile frogs is similar to that of adults and includes terrestrial and aquatic invertebrates, such as spiders, moths, flies, beetles, water striders, snails, and grasshoppers, as well as crustaceans and molluscs.

Garter snakes (*Thamnophis* spp.) are the principal natural predator of tadpoles, and juvenile and adult frogs. Other natural FYLF predators include aquatic insects, various fish species, birds, and mammals (Ashton et al. 1998). Moyle (1973) implicated the bullfrog (*Rana catesbeiana*) as a cause of the observed reduction of FYLF populations in the Central Valley and in the Sierra Nevada. The introduction of non-native fishes, including centrarchids (bass, sunfish, etc.), known to readily eat eggs of ranid frogs (Werschkul and Christensen 1977), and stocking of salmonids (trout) in streams where they historically did not exist, may also contribute to the disappearance or reduction of FYLF populations in Sierra streams. Additional human related impacts to FYLFs and their habitat include, but are not limited to, the construction and maintenance of dams and reservoirs, controlled stream flows, recreation, and livestock grazing (Jennings and Hayes 1994, Lind et al. 1996, Seltenrich and Pool 2002). In addition, disease may also play a role in amphibian declines. The California/Nevada Declining Amphibian Population Task Force (DAPTF) has reported that chytrid fungus, which is fatal to metamorphic and adult frogs, has become increasingly common in the Sierra Nevada (Speare et al. 1998).

Habitat Associations - The FYLF is a highly aquatic amphibian, spending most or all of its life in or near streams, though frogs have been documented underground and beneath surface objects more than 50 m (165 ft) from water (Nussbaum et al. 1983). The habitat requirements of FYLF are poorly understood (Van Wagner 1996). However, FYLFs are characteristically found close to water in association with perennial streams and ephemeral creeks that retain perennial pools through the end of summer. In

general, FYLFs appear to prefer low to moderate gradient (0 to 4%) streams, particularly for breeding; however, juvenile and adult frogs may also utilize moderate to steep gradient (4 to ≥10%) creeks during the summer and early fall. FYLFs utilize, or are associated with, a variety of aquatic habitat types, including pools, riffles, runs, cascade pools, and step-pools, depending on life stage and time of year.

Generally, FYLFs are found in small to fairly large streams that are characterized by the presence of cobble and boulder-sized substrate (Hayes and Jennings 1988). This habitat is probably best suited for oviposition and likely provides refuge habitat for larvae and post-metamorphs (Storer 1925, Zweifel 1955, Hayes and Jennings 1988). FYLF utilize the shallower portions of stream channels where velocities are low, such as at pool tail-outs, backwater habitat, and edgewater areas. Occurrence and distribution relative to canopy or shade may be somewhat tied to life stage, but streams that afford good exposed basking sites appear to be broadly utilized (Ashton et al. 1998). Though potentially abundant during the breeding season, adults are typically observed at a reduced frequency in these mainstem areas during the remainder of the year (Seltenrich and Pool 2002). It is speculated that the adults are either dispersing into streamside vegetation or adjacent tributaries, or possibly just reducing diurnal activity (Ashton et al. 1998).

Occurrence Information

The Project site is located within the range of FYLF. The California Natural Diversity Data Base (CNDDB) (CDFG 2006) was queried for FYLF occurrences within Placer and El Dorado counties. In addition, a search of the California Academy of Sciences-Stanford University (CAS-SU 2006) database and the U.C. Berkeley Museum of Vertebrate Zoology (MVZ) (U.C. Berkeley 2006) collections catalogue for Placer County and northern El Dorado County was performed.

The closest documented occurrence of FYLF from Clover Valley is an historical specimen (circa 1953, CAS No. 218322) collected at the North Fork American River confluence with the Middle Fork American River (Figure 2 – *Regional FYLF Occurrences*). This

locality is approximately xx km (11.8 mi) northeast of the Project area. The closest presumed extant FYLF population (CNDDB Occurrence , 200?) is approximately xx km (17 mi) east of the Project area. Figure 2 also delineates regional FYLF observations by ECORP biologists (Alicia Pool and Craig Seltenrich, 2004-2006). Copies of CNDDB, CAS_SU, and MVZ occurrence/specimen records are provided in Appendix A.

METHODS

On June 16, 2006, ECORP biologists Craig Seltenrich and Alicia Pool conducted field-based habitat assessments for FYLF within Clover Valley Creek in the Project area. Habitat assessments and limited visual encounter surveys (VES) were conducted following procedures outlined in *A Standardized Approach for Habitat Assessments and Visual Encounter Surveys for the Foothill Yellow-Legged Frog (*Rana boylii*)* (Seltenrich and Pool 2002). To facilitate evaluation of aquatic habitat for FYLF, the 3-km (1.9 mi) long section of Clover Valley Creek in the Project area was divided into three sections: the lower section (Site 1), the middle section (Site 2), and the upper section (Site 3). Separate habitat assessment data sheets were completed for each site.

Detailed habitat assessments were completed at each site using standardized data sheets. Representative site photographs were taken to document overall habitat conditions. Habitat parameters recorded during habitat assessments included the following:

- Aquatic/stream habitat types present
- Percent, type, and dominant form of margin, emergent, submerged, overhanging, and riparian vegetation
- Percent composition of aquatic substrate (silt/clay, sand, gravel, cobble, boulder, bedrock)
- Substrate embeddedness
- Percent, type, and dominant form of aquatic and terrestrial cover
- Stream and bank gradient
- Rosgen channel type

- Water turbidity
- Upland habitat type(s)
- Fish presence and type
- Amphibians and reptiles observed
- Impacts to amphibian habitat

Visual encounter surveys for FYLF were conducted concurrently with site assessments. General methods included using binoculars to scan the bank and adjacent aquatic habitat for frogs and inspecting cracks and crevices between cobble and boulder substrates for egg masses and tadpoles. All aquatic habitats including side channels and backwater pools within site boundaries were surveyed. Surveys began at the downstream end of each site (identified as 0 m; 0 ft) and continued upstream until the end of the site was reached. The VES was conducted on a warm sunny day with light winds (<15 mph) when the probability of observing exposed frogs is greatest.

RESULTS

Three sections of Clover Valley Creek within the Project area were assessed for FYLF habitat potential, including the lower section (Site 1), middle section (Site 2), and upper section (Site 3). Visual encounter surveys for FYLFs were also conducted in these stream sections. The location and extent of sites 1, 2, and 3 are delineated in Figure 3 – *Foothill Yellow-legged Frog Habitat Assessment and Survey Map*. In addition, representative site photographs are provided in figures 4 and 5.

Site Descriptions

The portion of Clover Valley Creek included in this assessment is characterized by a low gradient stream channel with perennial flows generated by overflow from a water distribution canal (Placer County Water Agency). At the time of the June 16, 2006 site visit, flow was estimated at approximately 3 cubic feet-per-second. Site habitat assessment data sheets are included in Appendix B.

Site 1 – Lower Section

Site 1 is situated within the lower reach of Clover Valley Creek extending from the lower property boundary upstream approximately 150 m (492 ft) upstream. The stream channel in the lower section of Clover Valley Creek is generally characterized by low gradient glide with limited pool habitat. The wetted channel width at the time of the June 2006 site visit was about 5 m (16 ft) and the bankfull width was estimated at 10 m. Aquatic substrate consisted of silt/clay (50 percent) and sand (50 percent). Moderate to high stream banks are densely (95-100 percent) vegetated with Himalaya blackberry. No emergent or submerged vegetation was noted in this section; however, overhanging vegetation (Range = 20 to 80 percent) consisting of willow, blackberry, and oak combined with a riparian canopy of willow, oak, and cottonwood provided a moderate (~50 percent) amount of mid-day shade.

There is a negligible (<10 percent) amount of aquatic cover but abundant (100 percent) terrestrial cover is provided by blackberry thickets along the creek. The upper two-thirds of the lower reach, upstream of Site 1, is bordered by wetland marsh. This is largely characterized by an extensive stand of dense cattails along the western border of Clover Valley Creek.

Bullfrog (*Rana catesbeiana*) tadpoles (2nd year) and unidentified minnows (cyprinid) were observed in Site 1.

Site 2 – Middle Section

The middle section of Clover Valley Creek (Site 2), located upstream of the wetland marsh, is approximately 200 m (656 ft) in length. At the time of the June 2006 site visit, this low-gradient section had a wetted channel width of about 4.5 m (14.8 ft). The bankfull width in this section was estimated at 12 to 15 m (39 to 49 ft) and some areas were slightly incised with steep banks. Stream habitat consisted of run (60 percent) and glide (40 percent), and aquatic substrate was a mixture of sand (60 percent) and

silt/clay (40 percent). Small sand bars and off-channel pools were present in wider portions of Site 2.

Moderately dense (70 percent) margin vegetation in Site 2 was dominated by grasses, blackberry, and cattail. No emergent vegetation was noted in Site 2, but a nominal (<10 percent) amount of submerged vegetation composed of green algae was observed. The stream channel in this section was relatively open with a small (20 percent) amount of overhanging vegetation consisting of willow, blackberry, and alder. An upper riparian canopy of willow, alder, and oak provides about 60 percent mid-day shade.

There is a negligible (<10 percent) amount of aquatic cover consisting entirely of woody debris and terrestrial cover (80 percent) is provided by blackberry thickets, grasses, and woody debris along the creek.

Juvenile bullfrogs and crayfish (Pacifasticus sp.) were observed in Site 2.

Site 3 – Upper Section

Site 3 is a 200 m (656 ft) section of Clover Valley Creek located in the uppermost portion of the Project area. The stream channel in this section of creek is narrower relative to the middle (Site 2) and lower (Site 1) sections, and exhibits a moderate degree of down-cutting within the low-flow channel. At the time of the June 2006 site visit, the wetted channel width in Site 3 was approximately 2.5 to 3 m and the bankfull width was estimated at about 8 to 10 m (26 to 33 ft). Stream habitat in Site 3 consisted of run (70 percent) and low-gradient riffle (30 percent). In addition, there were several main channel pools associated with woody debris. Aquatic substrate consists of sand (65 percent), gravel/pebble (20 percent), and silt/clay (15 percent). The gravel and pebble substrates are largely associated with riffle areas, and a short section [~20 m (66 ft)] of step-pool/riffle habitat in the vicinity of a concrete weir contained limited cobble and boulder along the stream margin; however, bottom substrate in this section is dominated by sand.

Moderately dense (80 percent) margin vegetation consisting of grasses, blackberry, and rushes occurs along the shoreline in Site 3. One off-channel pool and several sand and gravel/pebble bars were noted in Site 3 but these areas are highly limited in distribution and extent. No emergent vegetation was noted in Site 3, but a nominal (<10 percent) amount of submerged vegetation composed of green algae was observed. Overhanging vegetation consisting of willow, blackberry, and alder was variable (Range = 20 to 70 percent) throughout Site 3, and combined with the willow, alder, and oak riparian canopy to provide moderate (60 percent) mid-day shade. A small (~20 percent) amount of aquatic cover consists of woody debris, rootwads, and undercut banks, and terrestrial cover (80 percent) is composed of woody debris and margin vegetation.

No amphibians or aquatic species were observed in Site 3 during the site visit; however, one terrestrial garter snake (*Thamnophis elegans*) was observed along the stream margin at the bottom of Site 3.

Visual Encounter Survey

No FYLFs were observed during the VES on June 16, 2006. Bullfrog tadpoles and juveniles were observed in Site 1 and Site 2, respectively, and were the only amphibian documented within the sections of Clover Valley Creek surveyed. Other species observed include unidentified minnows, crayfish, and one garter snake.

SUMMARY

The habitat characteristics typically associated with FYLFs were largely absent from the portion of Clover Valley Creek surveyed within the Project area. Suitable substrate for egg mass attachment (e.g., cobble and boulder) was absent throughout, except for a short section in the upper reach of the creek, in the vicinity of a concrete weir. However, the cobble and boulder substrate in this area was predominantly along the stream margin outside of the wetted channel. The sand and silt/clay dominated creek channel within the Project area also lacks suitable cover for FYLF tadpoles.

The dense streamside vegetation significantly limits the amount of potential basking habitat. In addition, a well-developed riparian canopy shades a large portion of the creek further limiting potential basking areas.

The negative survey findings and lack of FYLF habitat in Clover Valley Creek is strong evidence that the species is not present. Furthermore, the distance to the nearest known historical records and extant locality further suggests

REFERENCES

Ashton, D. T., A. J. Lind, and K. E. Schlick. 1998. Foothill yellow-legged frog (*Rana boylii*) natural history. USDA Forest Service, Pacific Southwest Research Station, Arcata, California. 18 pp.

CAS-SU (California Academy of Sciences-Stanford University). 2006. Online herpetology catalogue, California Academy of Sciences, San Francisco, CA.

CDFG (California Department of Fish and Game). 2006. California Natural Diversity Data Base (CNDDB), Natural Heritage Division, CDFG, Sacramento, CA. Fitch, H. S. 1936. Amphibians and reptiles of the Rogue River Basin, Oregon. American Midland Naturalist 17(3):634-652.

Grinnell, J., J. Dixon, and J. M. Linsdale. 1930. Vertebrate natural history of a section of northern California through Lassen Park region. University of California Publications in Zoology 35:1-594.

Hayes, M. P. and M. R. Jennings. 1988. Habitat correlates of distribution of the California red-legged frog (*Rana aurora draytonii*) and the foothill yellow-legged frog (*Rana boylii*): implications for management. *In* R. C. Szaro, K. E. Severson, D. R. Patton (tech. Coords.), Management of Amphibians, Reptiles, and Small Mammals in North America, pp 144-158. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, Gen. Tech. Rep. RM-166, Fort Collins, Colorado.

Jennings, M. R. 1988. Natural history and decline of native ranids in California. Pp.61-72 *in* Proceedings of the Conference on California Herpetology. Eds. H. P. DeLisle, P. R. Brown, B. Kaufman, and B. M. McGurty.

Jennings, M. R., and M. P. Hayes. 1994. Amphibian and reptile species of special concern in California. A Report to the California Department of Fish and Game, Rancho Cordova, California. 255 pp.

Kupferberg, S. J. 1996. Hydrologic and geomorphic factors affecting conservation of a river-breeding frog (*Rana boylii*). Ecological Applications 6(4):1322-1344.

Lind, A. J., H. H. Welsh, Jr., and R. A. Wilson. 1996. The effects of a dam on breeding habitat and egg survival of the foothill yellow-legged frog (*Rana boylii*) in northwestern California. Herpetological Review 27(2):62-67.

Livezey, R. L. 1963. Distribution of some California amphibians and reptiles. *Herpetologica* 18:279-281.

Moyle, P. B. 1973. Effects of introduced bullfrogs, *Rana catesbeiana*, on the native frogs of the San Joaquin Valley, California. Copeia 1973:18-22.

Nussbaum, R. A., E. D. Brodie, Jr., and R. M. Storm. 1983. Amphibians & reptiles of the Pacific Northwest. University Press of Idaho. 332 pp.

Seltenrich, C. P. and A. C. Pool. 2002. A standardized approach for habitat assessments and visual encounter surveys for the foothill yellow-legged frog (*Rana boylii*). Pacific Gas and Electric Company.

Speare, R., L. Berger, and H. Hines. 1998. How to reduce the risks of you transmitting an infectious agent between frogs and between sites. James Town University, Townsville, Australia. 9 pp. www.jcu.edu.au/school/phtm/PHTM/frogs/prevent.htm.

Stebbins, R. C. 1985. A field guide to western reptiles and amphibians. Peterson field guide series, Houghton Mifflin Company, Boston.

Storer, T. L. 1925. A synopsis of the amphibia of California. University of California Publications in Zoology 27:1-342.

Twitty, V. C., D. Grant, and O. Anderson. 1967. Amphibian orientation: An unexpected observation. Science 155:352-353.

U.C. Berkeley. 2006. Museum of Vertebrate Zoology online collections catalogue.

U.S. Department of the Interior, Geological Survey. 1978. Hydrologic Unit Map, State of California. Geological Survey. Reston, Virginia.

Van Wagner, T. J. 1996. Selected life-history and ecological aspects of a population of foothill yellow-legged frogs (*Rana boylii*) from Clear Creek, Nevada County, California. Master's Thesis, Department of Biological Sciences, California State University, Chico. 143 pp.

Werschkul, D. F. and M. T. Christensen. 1977. Differential predation by *Lepomis macrochirus* on the eggs and tadpoles of *Rana*. Herpetologica 33:237-241.

Wright, A. H. and A. A. Wright. 1949. Handbook of frogs and toads of the United States and Canada. Third edition. Comstock Publishing Company, Ithaca, New York.

Zweifel, R. G. 1955. Ecology, distribution, and systematics of frogs of the *Rana boylei* group. University of California Publications in Zoology 54(4):207-292.

LIST OF APPENDICES

APPENDIX A

CNDDB, MVZ, and CAS FYLF Occurrence/Specimen Records

APPENDIX B

Copy of Field Data Sheets

APPENDIX C